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Europe and Central Asia's Great Post-Communist Social Health Insurance Experiment:

Impacts on Health Sector and Labor Market Outcomes

Adam Wagstaff
Rodrigo Moreno-Serra

The World Bank
Development Research Group
Human Development and Public Services Team
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Abstract

The post-communist transition to social health insurance in many of the Central and Eastern European and Central Asian countries provides a unique opportunity to try to answer some of the unresolved issues in the debate over the relative merits of social health insurance and tax-financed health systems. This paper employs a regression-based generalization of the difference-in-differences method and instrumental variables on panel data from 28 countries for the period 1990-2004. The authors find that, controlling for any concurrent provider payment reforms, adoption of social health insurance increased national health spending and hospital activity rates, but did not lead to better health outcomes. The authors also find that adoption of social health insurance reduced employment in the economy as a whole and increased unemployment, although it did not apparently increase the size of the informal economy.

This paper—a product of the Human Development and Public Services Team, Development Economics Research Group—is part of a larger effort in the department to shed new light on health financing and delivery issues. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The corresponding author may be contacted at awagstaff@worldbank.org.

Europe and Central Asia's Great Post-Communist Social Health Insurance Experiment: Impacts on Health Sector and Labor Market Outcomes

by

Adam Wagstaff[a] and Rodrigo Moreno-Serra[b]

[a] Development Research Group, The World Bank, Washington DC, USA
[b] Department of Economics & Related Studies, University of York, York, YO10 5DD, United Kingdom

Contact author: Adam Wagstaff, World Bank, 1818 H Street NW, Washington, D.C. 20433, USA. Tel. (202) 473-0566. Fax (202)-522 1153. Email: awagstaff@worldbank.org.

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1. Introduction

Ninety percent of the OECD countries finance the majority of their health expenditures publicly (the exceptions are Mexico and the United States). The OECD is split roughly equally into tax-financed systems and social health insurance (SHI) systems: in half of the 30 countries, SHI contributions make up a majority of general government spending on health. In the rest of the world, the fraction of countries financing the majority of their health spending publicly is smaller (56% compared to 70% in the OECD), and only 21% finance the majority of their government spending through SHI.[1]

The relative merits of SHI and tax finance is an old debate, but one where the evidence is surprisingly thin. There is fairly clear evidence that payments for health care are more progressive or less regressive in tax-financed systems than in SHI systems.[2] It is also clear that tax-financed systems are more successful at ensuring universal coverage within a single health system; SHI systems, by contrast, typically struggle to cover the informal sector and the poor.[3] But the presumption that those not covered by a SHI scheme fare less well—in terms of the quantity and quality of care they receive, the amount they pay for it out-of-pocket if they get it, or both—is not always borne out by the limited evidence available.[4]

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[1] The figures in this paragraph are calculated from data in the World Health Report annexes.
[2] Wagstaff et al. (1992; 1999) find that SHI is less progressive than tax-financed systems (in fact, is mostly regressive) in the OECD countries. O'Donnell et al. (2007) find the same in Asia.
[3] Carrin and James (2004) document the time it took several of the SHI countries to achieve universal coverage. Baeza and Packard (2006) document coverage in several Latin American countries. Wagstaff (2007) includes coverage statistics for several countries, as well as for different groups.
[4] Being in a SHI scheme is typically found to be associated with higher rates of utilization, but not always lower levels of out-of-pocket spending or a lower risk of especially large out-of-pocket payments—see e.g. Gertler and Solon (2000), Waters, Anderson and Mays (2004), and Wagstaff and Lindelow (2005).

Important as these issues relating to payments, coverage and utilization among subpopulations are, they are not the focus of this paper. Rather the focus is on the relative merits of SHI and tax-financed systems at the population level. Here too the evidence is thin. There is little systematic evidence on whether SHI systems tend to spend more on health care, and if so whether this translates into superior health outcomes. There are those who argue that SHI enables higher levels of health spending. The population may, it is argued, be more willing to pay SHI contributions than (other) taxes because the revenues are earmarked for health services and contributions confer entitlements to use them. There are those too who argue that SHI systems are more efficient at transforming money into health, because they more easily permit a separation between the purchasing of health care (done by a SHI agency kept on its toes by the contributors) and the provision of health care (which could be done by either government or private providers).

The evidence on these points is virtually nonexistent and there are counterarguments. Contributions are linked to earnings through a formula and typically subject to ceilings that may change infrequently, with the result that at times of rapid growth SHI revenues may not keep pace with per capita incomes and a tax-financed system might produce higher revenue growth.[5] Some governments have reduced their tax-financed health spending as SHI contributions have increased, raising the suspicion that total government spending on health may not increase following SHI adoption.[6] Evasion in SHI schemes has proved a major problem[7], so if the treasury bases its tax-financed spending on theoretical contributions, total government spending on health may actually *fall* following SHI adoption. Some SHI agencies have become corrupt and unresponsive to their contributors, selecting providers through cronyism rather than through

[5] See, for example, Lu and Hsiao (2003) on Taiwan's experience in this regard.
[6] See, for example, Twigg (1999) on Russia's experience.
[7] See, for example, Escobar and Panopolou (2003) on Colombia, and Twigg (1999) on Russia.

transparent and competitive contracts.[8] SHI agencies may be more prone to "capture" by provider interest groups who may secure better terms (including higher wages) for providers. One suspects that SHI systems are also likely to be administratively expensive, often requiring revenue-collection efforts separate from those of the tax authorities, a contracting apparatus, and where multiple SHI schemes exist alongside one another a loss of monopsony power. It is not implausible that SHI systems spend less and are less successful at translating money into better health. But even on these counterarguments, the evidence is at best anecdotal.

It is not just with respect to the health sector that there is a lack of evidence on the merits and demerits of SHI and tax-financed health systems. The same is true of their consequences for labor markets. Some of the "old" SHI countries—notably France, Germany and the Netherlands—have recently been reducing or are trying to reduce their reliance on payroll financing[9], in part out of a belief that it has contributed to unemployment and informalization of the labor market. These issues have also been debated in Latin America.[10] Yet there is really very little direct evidence on this issue, most taking the form of indirect evidence from studies of the employment effects of payroll taxes.[11] This indirect evidence, however, refers to all payroll taxes which is problematic as the impacts on labor supply may be different between, say,

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[8] A World Bank report in the late 1990s on health insurance in Argentina (World Bank 1997), commenting on the purchasing capacity of health insurers, argued that "it is acknowledged by Argentines that personal connections and corrupt practices, instead of quality and economy, weigh heavily in the award of capitated contracts and other payments to medical providers and suppliers, and this adds substantially to the inefficiency and high cost of health care in Argentina" (p.7).

[9] France widened the tax base from earnings to include nonwage income. Germany is contemplating reducing the emphasis on the payroll, while the Netherlands in 2005 introduced a reform where insurers receive only half their income from payroll revenues (albeit channeled through a central fund), the rest coming from flat-rate direct contributions from members (with offsetting income supplements for low income groups) (Gottret and Schieber 2006; International Network on Health Policy & Reform 2006).

[10] See Baeza and Packard (2006) on this.

[11] Kugler and Kugler (2003) have estimated the impact of payroll tax increases in Colombia that were implemented in parallel with the health financing reforms. According to their estimates, the health financing reforms, which raised the payroll tax rate by 5 percentage points, would have reduced wages by between 0.7% and 1.1%, and employment by between 2% and 2.5%. By contrast, Bauer and Riphahn (2002) find that Germany's payroll tax has had very limited employment effects.

pensions and health services, especially in poorer countries, since people may think it more likely they will benefit from the health services they get to use from SHI contributions than the pensions they may never enjoy resulting from pension contributions because they fear they will not live long enough. Moreover, studies of the labor market consequences of payroll tax changes do not answer the question of what happens to employment and informality when smaller (or larger) payroll taxes are replaced by larger (or smaller) other taxes.

Getting at relative merits and demerits of SHI and tax-financed health systems through a cross-country econometric analysis where some systems are financed through SHI contributions and others are financed through general revenues is clearly problematic because there are likely to be unobservable variables that are correlated with both the type of financing system in place and the outcomes of interest (i.e. SHI is potentially endogenous). A potentially more promising strategy would be to look for *changes* in the way countries finance their health care, exploiting the variations in changes across countries to eliminate (time-invariant) unobservable variables. The difficulty with this approach is that in the group of countries that have the best data (the OECD), there have been very few switches between the SHI and tax-financed camps (six "old" OECD countries abandoned SHI in the 1970s and 1980s, notably Denmark, Greece, Iceland, Italy, Portugal and Spain) and the transitions occurred some time ago, so the data available are very limited.

This paper looks instead to a (mostly) different group of countries where transitions have occurred with greater frequency and more recently, namely the countries of (central and eastern) Europe and Central Asia (ECA). Of the 28 countries that are part of the World Bank's ECA region, 14 abandoned tax-finance and adopted SHI at some stage between 1990 and 2004 (and 4 other countries had adopted SHI prior to 1990). These countries provide not only an interesting "experiment" from the point of view of health financing, but also are data-rich countries, having inherited and largely maintained the communist tradition of extensive data-gathering, and falling under the most data-rich regional office of the World Health Organization.[12] The ECA health financing experiment thus affords a valuable "laboratory" to try to answer some of the unanswered questions listed above.

To get at these issues, we use a regression-based generalization of the differences-in-differences (DD) method on panel data from the 28 ECA countries for the period 1990-2004. We explore different approaches to allowing for the possible endogeneity of SHI. The first is a simple individual-specific effects model estimated along the lines of the DD approach. This allows for the endogeneity of SHI insofar as the unobservables that are correlated with SHI adoption and with our outcomes are time-invariant. We explore two more specifications. One allows for a time-varying unobservable that can be correlated with SHI adoption and outcomes, and whose growth rate is allowed to vary from one country to the next. The other approach is Instrumental Variables (IV), implemented in the case of those outcomes for which the DD generalizations do not seem to control adequately for the possible endogeneity of SHI adoption.

The organization of the paper is as follows. Section 2 provides a brief history of the SHI reforms in the post-communist ECA region. Section 3 outlines our methods. Section 4 describes our data. The empirical results for the health and labor analyses are presented in sections 5 and 6, respectively. Section 7 discusses the results and presents our conclusions.

[12] The European office of the World Health Organization developed and has maintained a huge database to track progress towards its Health for All initiative. In addition, it is home to the European Observatory on Health Systems and Policies, which has produced detailed overviews of the health systems of the member countries (known as Health Systems in Transition (HiT) profiles), as well as a variety of volumes that discuss health systems and health policies in the region.

2. The SHI reforms of Europe and Central Asia: a brief history

Under communism, health care in the ECA countries was financed out of general revenues (and out-of-pocket payments) and delivered through a centrally-planned “Semashko” model consisting of a tiered system of health providers, each allocated budgets according to population-based norms, with health workers paid by salary.[13] In the early 1990s, as most countries shifted away from communism, several looked to SHI to solve several emerging problems.

The most pressing one was the dramatic decline in government revenues as a share of GDP, caused by a variety of factors, including the growth of the private and informal sectors where tax compliance was lower, a shrinking of traditional tax bases such as state-owned enterprises, and pressures for tax cuts from a population experiencing declines in real income. With falling GDP and revenues falling as a share of GDP, health sectors experienced substantial cuts in government spending. SHI was seen, rightly or wrongly, as a way of protecting spending levels in the health sector, the presumption apparently being that earmarking would help ensure the health sector did not have to compete with other sectors in government spending allocation decisions, and that earnings in the economy as a whole would fall less than government revenues and be more stable. Providers were especially enthusiastic about SHI which they saw as a way to increase their salaries.

SHI was also perceived as having other advantages vis-à-vis both the financing and delivery of health care. One was the perceived potential to reduce the grip of finance and health ministries over the finance and delivery sides of the system, the vision being that payroll tax

[13] This section draws heavily on Langebrunner et al. (in press).

contributions could flow automatically to a SHI agency that would sit at arms' length from both the finance and health ministry, and the agency could develop a purchasing capacity and make government providers more accountable for their performance, through provider payment reform, selective contracting, and competition between public and private sector providers for SHI contracts. Autonomization of providers was seen as a logical part of this process, which was seen as necessary for better performance and greater accountability.

Of the 28 ECA countries, 14 introduced payroll taxes earmarked for health care at some stage between 1990 and 2004, and four others had already done so prior to 1990. Early SHI adopters in the 1990s included Estonia, Hungary, Lithuania, Macedonia, and Slovenia; all adopted SHI in the period 1990-92. Some countries adopted much later: Bulgaria, for example, adopted SHI as late as 1999. Often, both the employee and employer are liable, though of course there may be wide difference between who is legally liable for what and who ends up bearing the incidence of the payroll tax, the latter depending on conditions in the labor and product markets. Contributions are mandatory, and in exchange for them the contributing employee is entitled to receive health services under the terms of the SHI scheme. Groups other than formal sector workers usually have some coverage. Contributions are required from the self-employed in all SHI countries, and from pensioners in some. Other groups are financed out of general revenues, but often the contributions are not specified and insufficient funds are provided in respect of these groups, who sometimes have inferior de facto coverage.

SHI does not always raise more than 50% of revenues, though in some countries its importance has increased over time and has gradually grown to 50% or more. This is clear from Figure 1, which also shows the timing of the introduction of earmarked payroll taxes in different countries. In central and eastern Europe, SHI shares of total spending have tended to be higher, and payroll tax rates have tended to be higher there as a result. In the first group of countries, payroll tax rates are normally between 10% and 15% of earnings, while in the countries of the former Soviet Union, they are less than 10%, often considerably so (Langenbrunner, Sheiman and Kehler in press). It is worth noting that some countries (e.g. Latvia, Lithuania and Poland) introduced earmarked taxes for health care, but the tax base is income not earnings, so from a financing perspective these are not “pure” SHI systems.

Some but not all of the SHI adopters—and, interestingly, some countries that have earmarked taxes other than payroll taxes—have changed not only the sources of finance but the way monies flow to providers.[14] SHI countries now typically have a SHI agency, but so too do Poland and Latvia that rely on income taxes or general revenues rather than payroll taxes. These are typically independent of the ministry of health and have responsibility for administering the SHI scheme or at least some functions, such as collecting contributions, setting or recommending contribution rates and ceilings, pooling contributions, etc. Where it exists, the SHI agency pays providers, but some funds still flow from the health ministry (allocations for capital spending, for example, but also sometimes other items of spending too). Where there is a SHI agency, it typically has explicit contracts with providers, though this has not always been the case, and has been common only in recent years. The contracting, however, is not always selective, although this too has become more common recently. Often there is no contracting with the private sector, and where it does occur, it is typically in primary care.

Most SHI countries have also shifted from budgets as a way of paying hospitals (the biggest spenders in a health sector) to either fee-for-service (FFS) or a patient-based payment method (PBP), such as diagnosis-related groups (DRGs). Figure 2 shows the timing of the

[14] This paragraph relies heavily on information provided in the HiT series.

various hospital payment reforms, where we have used the *HiTs* series to classify a country's predominant hospital payment method in a given year as falling into one of three categories: (i) fixed budgets/block grants (the prevailing method under the communist Semashko system), (ii) fee-for-service/payment by bed days, or (iii) patient-based systems (mainly DRG-based) (cf. Ellis and Miller 2008). Of the 18 countries that adopted SHI, 12 switched from the use of budgets, though in three cases the switch occurred with a lag. Some switched to FFS and stuck with it, while others switched subsequently to a PBP. A few switched immediately to PBP. Interestingly, some countries without payroll-based contributions also switched from budgets. The lag in provider payment reform, the fact that different countries opted for different payment methods and sometimes switched a second time after SHI adoption, and the fact that some non-SHI countries also switched from budgets during our period all help to create an opportunity to see how far any impact of SHI adoption is due to the shift to payroll finance and the setting up of a SHI agency, rather than to provider payment reforms which could have occurred (and in some cases did occur) even without the adoption of SHI.

3. Methods

Let y_{it} be the outcome of interest in country i at time t, X_{it} be a vector of covariates thought to potentially influence both the outcome and the SHI adoption decision, and SHI_{it} be a dummy variable taking on a value of 1 if country i has a SHI health financing system at time t. An obvious model to estimate is:

(1) $$y_{it} = \theta_t + X_{it}\gamma + \delta SHI_{it} + \alpha_i + u_{it},$$

where θ_t is a time-specific intercept, the coefficient δ gives the impact of SHI on the outcome y_{it}, α_i is a country-specific effect which captures time-invariant unobservables potentially correlated with SHI status, and u_{it} is an idiosyncratic error term (iid over i and t). In the special case where the X_{it} are omitted, eqn (1) collapses to the traditional difference-in-differences (DD) estimator. Eqn (1) can be estimated as a fixed effects model, or in first differences. In the latter case, the estimating equation can be expressed as

$$(2) \qquad \Delta y_{it} = \xi_t + \Delta X_{it}\gamma + \delta \Delta SHI_{it} + \Delta u_{it},$$

which can be consistently estimated by pooled OLS.

Care needs to be taken to get accurate standard errors in this type of analysis. Bertrand et al. (2004) have shown that many outcome variables used in published policy impact analyses generate positive serial correlation in the u_{it}. If ignored, and the model is estimated as a fixed-effects specification, this positive serial correlation results in standard errors that are too small, and t-statistics that are too large—possibly dramatically so. In such a case, first differences may be preferred. Of course, if the u_{it} in eqn (1) are serially uncorrelated, the error term in the first-differenced version may well be subject to negative serial correlation, in which case the standard errors would be overestimated. An obvious strategy is to report standard errors that are robust to any type of serial correlation (and heteroskedasticity), whether one uses fixed effects or first differences. This is what we do below in all our models. The Monte Carlo results reported by Bertrand et al. (2004) suggest that with a sample of 28 countries the rate of rejection of the null hypothesis of no impact ought to be close to the right one.[15]

[15] We also experimented with (block) bootstrapped standard errors, and obtained broadly similar results.

Our basic framework of individual-specific effects represented by eqn (1) captures the possible endogeneity of SHI_{it} to the extent that the unobservables that are correlated with both SHI_{it} and y_{it} are time-invariant. However, endogeneity of SHI adoption will still be a problem in our basic framework if there are time-varying unobservables correlated with both SHI_{it} and y_{it}. In this sense, an additional source of country heterogeneity can be introduced in a more general specification, through a random trend model (cf. e.g. Wooldridge 2002):

$$(3) \qquad y_{it} = \theta_t + X_{it}\gamma + \delta SHI_{it} + \alpha_i + g_i t + u_{it},$$

where g_i is the country-specific trend of y_{it}, and α_i and g_i are allowed to be arbitrarily correlated with the regressors. Eqn (3) thus allows for both time-invariant and time-varying unobservables that may be correlated with y_{it} and SHI_{it}, albeit in a way that assumes the unobservable grows over time in a linear fashion. One way of estimating this model is differencing eqn (3) to get

$$(4) \qquad \Delta y_{it} = \xi_t + \Delta X_{it}\gamma + \delta \Delta SHI_{it} + g_i + \Delta u_{it},$$

and using a fixed effects estimator on this differenced equation.[16] We can test eqn (3) against eqn (1) by testing the joint significance of the g_i. Friedberg (1998) uses such a model in her analysis of divorce laws, and finds that allowing for state-specific trends is crucial to unearthing the impacts of these laws.

An alternative way to relaxing the assumption that SHI is endogenous only insofar as it is correlated with the α_i and g_i is to find instruments for the SHI adoption decision. Suppose we have a set of instruments Z_{it} and our basic model in levels:

[16] Alternatively we could use the first differences estimator once again, this time applied to eqn (4) so as to eliminate g_i, and estimate the resulting model by pooled OLS. However, this procedure would mean losing an additional period of time for estimation purposes, which is why we have opted for the fixed effects estimator in the case of the random trend model.

(5) $$y_{it} = \theta_t + X_{it}\gamma + \delta SHI_{it} + e_{it}$$

Under the assumption that the instruments are weakly exogenous or predetermined, i.e. $E[Z_{is}e_{it}] = 0$, $s<t$, t=1,…T, with T representing the number of time periods in the data, it is possible to use lags of the potentially endogenous SHI variable as instruments, in addition to "traditional" instruments obtained outside the model (Anderson and Hsiao 1981). If these instruments are valid (i.e. exogenous and strong in the sense of being highly correlated with our instrumented SHI dummy--assumptions which can be tested), they should control for any kind of endogeneity including that arising from country-specific effects and trends. Eqn (5) can then be consistently estimated by two-stage least squares (IV-2SLS) or using the more efficient two-step generalized method-of-moments (IV-GMM) estimator (cf. e.g. Cameron and Trivedi 2005).

We implement both IV approaches in the cases of those outcomes for which the potential endogeneity of SHI adoption does not seem adequately controlled for by our DD-based specifications (on how we determine this, see below), using as instruments for SHI_{it} in eqn (5) the first lag of the SHI dummy ($SHI_{i,t-1}$) and an indicator for whether the country in question had a SHI system prior to the communist takeover in the mid-late 1940s. Although under weak exogeneity we could theoretically use more lags of the SHI variable as instruments, we include only its first lag in the instrument set due to the lack of variation over time in our SHI dummy[17], leading to the redundancy of additional lags and loss of degrees of freedom for overidentifying restrictions tests. The rationale for using the pre-communist presence of SHI arrangements as an instrument is that the tradition of health systems based on the Bismarck model in some ECA countries prior to communism may have increased the likelihood of SHI re-adoption in these

[17] As it can be seen in Figure 3, transitions between tax-funded health systems and SHI arrangements occur only once in all but one of the countries in our sample, the only exception being Kazakhstan. The exact definition of what constitutes a SHI system for our purposes is given later.

countries after the transition to market economies, but that pre-communist characteristics could reasonably be thought to be uncorrelated with our health and labor outcomes (measured about 45 years later) except by affecting the probability of SHI adoption. The relevance of our two instruments is assessed through a battery of tests, and Hansen tests are used to check the exogeneity of our instruments in the estimated models. Given the relatively small number of observations used to estimate some models, IV procedures (mainly GMM) potentially introduce small sample bias in the estimations; this adds to the—often sizeable—increase in standard errors expected when using IV methods relative to those obtained by OLS procedures. We therefore draw our basic empirical conclusions from the results of the DD-based models, and rely on the IV procedures mainly when SHI endogeneity seems to pose a problem even after controlling for country-specific effects and trends.

4. Data

We use annual data on SHI status, health and labor market outcomes for the 28 ECA countries, from 1990 to 2004. Our dataset has been constructed using a variety of sources; the description in this section begins with our independent variable of interest, SHI status, and then continues for the variables included in our health and labor models, respectively. In the health sector models, data are generally available for most country-year combinations; fewer observations are available for the labor market models.[18]

[18] In the case of Bosnia-Herzegovina, the period between 1992 and 1996 has been excluded from the analysis due to the lack of data for many dependent variables and the complete disorganization of the health system—which obviously included the SHI scheme—during the war period.

Social health insurance status

We define our SHI dummy SHI_{it} as taking a value of one if in country i at time t earmarked payroll taxes for health care were collected from formal-sector workers and there was a SHI agency in place. The required information was obtained mainly from the *Health Systems in Transition* (*HiT)* document series published by the European Observatory on Health Systems and Policies, a partnership between the European Office of the World Health Organization (WHO) and governmental, national and international agencies. World Bank reports and consultations with its staff working in the ECA region were also used in order to obtain data on countries for which HiTs have not yet been published, and to double-check the information assembled through the HiTs.[19]

Our derivation of the SHI status indicator is shown in Table 1. Our strict definition means that we end up classifying as non-SHI some country-year combinations that are often—we believe, erroneously—classified as SHI (such as Latvia and Poland). Furthermore, we classify Romania as SHI only after 1998; despite the fact that payroll taxes were used somewhat before then, it was not until 1998 that SHI was fully set up with a SHI agency and with payroll contributions making up the majority of health care revenues. We explore the sensitivity of our results to not classifying these as SHI countries, by re-running our models with the three of them classified as SHI for the years indicated in Table 1.

[19] Our classification is consistent with the evidence presented in Langenbrunner et al. (in press) which came to our attention after the empirical work for the paper hade been completed.

Figure 3 depicts the pattern of SHI adoption over time in the countries of our sample. Our SHI status dummy is equal to 1 in about half (218 observations) of the 442 country-year combinations for which we have non-missing values of the indicator.

Health sector outcome variables

Our health sector outcome measures include: per capita health spending (total, public and private) and the share of spending going on salaries; population health status; hospital activity rates and capacity utilization; and quality-of-care indicators. Our variable definitions and sources are briefly described below and the descriptive statistics for them—for the full sample and disaggregated by SHI status—are presented in Table 2.[20]

We measure per capita health spending as total health care expenditures per capita expressed in constant 2000 dollars adjusted for purchasing power parity (deflated using the United States GDP deflator), to allow comparisons in real values between countries and over time (Gerdtham and Jonsson 1992). The source for these figures is the World Bank's *World Development Indicators (WB-WDI)* database. The WB-WDI database is the primary World Bank database for development data, obtained from recognized international sources. It contains an expanded set of the economic, health and other time series indicators published in the Bank's *World Development Reports*. Average health spending for the period 1990-2004 was US$403 PPP per capita. The Czech Republic, Hungary and Slovenia are the countries with highest spending levels (each with an average of at least US$857 PPP per capita between 1990-2004 and at least US$1,225 PPP per capita in the last year), whereas Azerbaijan, Kyrgyz Republic, Tajikistan and Uzbekistan have the lowest spending levels in our sample (at most US$132 PPP

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[20] The complete list of definitions and sources for our health sector outcome variables can be found in Table 9 in the Appendix.

per capita on average for 1990-2004 and US$163 PPP per capita in the last year). On average, government health spending accounted for almost 70% of a country's total health spending over the period of analysis and 60% in the year 2003; Armenia and Tajikistan exhibited the smallest shares of government health spending in 2003—less than 21%—whilst in Czech Republic and Slovak Republic that share was higher than 88% in the same year.

We also include among our indicators health sector salaries as a percent of total health spending. Data on this—like the data on many of the remaining health sector outcome indicators—are taken from the World Health Organization's *Health for All Database (WHO-HFA)*. This database, maintained by the European Office (Copenhagen) of the WHO, contains data for all European countries plus the former USSR republics in Central Asia on about 600 health indicators, including annual information on morbidity and disability; hospital discharges; and health care resources, utilization and expenditure. The original sources of information are mainly own WHO estimates, country statistical offices and other international organizations. Given the general scarcity of available health information for developing countries, the availability of this database is good news for researchers dealing with health-related issues specifically in the former communist countries of Europe and Central Asia. In our attempt of getting a comprehensive, general picture of the (potential) SHI impact on population health conditions, we include dependent variables related to life expectancy, group-specific mortality rates, disease-specific standardized death rates and incidence rates and measures of utilization of services such as caesarean sections and immunization. We used the same database for obtaining data on hospital indicators, which include measures of average length of stay, bed occupancy, number of hospital beds (from the WB-WDI database), admissions and disease-specific discharges. We also include in our analysis a few indicators of avoidable deaths—such as standardized death rates for appendicitis and hernia and intestinal obstruction—as proxies for the average quality of hospital care. Finally, alternative infant mortality and under-five mortality rates were obtained from WB-WDI and the *TransMONEE 2006 Database*, a UNICEF IRC (Florence) database which contains data for ECA countries except Turkey on 146 economic and social indicators divided into ten different topics and ranging from 1989 to 2004.

Simple comparisons of the average outcomes presented in Table 2 indicate that SHI countries tend to spend more in health care, both in the public and private sectors, and a higher fraction of the government health spending seems to be absorbed by salaries. On the other hand, there is some indication that mortality and disease incidence rates are generally lower in SHI countries, whilst no clear pattern emerges for immunization rates. As far as hospital indicators are concerned, total length of stay, in-patient admissions and beds tend all to be lower in SHI countries; most of our diagnosis-specific hospital discharges indicators are higher for SHI countries, and there is no clear pattern concerning our quality-of-care proxy measures. Visual comparisons of the evolution of SHI adoption in our sample vis-à-vis two health outcomes, average total health expenditures per capita and WHO's average infant mortality rate (Figure 4 and Figure 5), show somewhat clear patterns: average health spending slightly decreased during the first period of growing SHI adoption by ECA countries (1990-93) but experienced a sustained increase during and after the second period of SHI growth (1995-98, when SHI prevalence reached more than 50%), while the average infant mortality rate tended to remain stable around 22 per thousand births during the first period but continuously decreased during and after the second period, when SHI prevalence reached half of the countries. Determining whether the differences and patterns described above are due to SHI adoption (that is, a *causal* effect) or whether they merely reflect pre-existing differences—observable and/or unobservable—between countries that eventually adopted SHI and those that did not (a *selection* effect) is the main task of our empirical work.[21]

Labor market outcome indicators

Our labor models are estimated with gross wages, unemployment, employment and informality measures as dependent variables. We briefly describe their definitions and sources below, and their descriptive statistics are presented in Table 3.[22]

Total annual gross wages and salaries in local currency units were drawn from the WB-WDI ECA regional database and transformed into yearly constant PPP averages for the employed population aged 15-59 using purchasing power parity conversion factors and the US deflator, both available at the WB-WDI database as well. We use annual data on total unemployment and registered unemployment rates obtained from the *Key Indicators of the Labor Market* (KILM) database, published by the International Labor Organization (ILO). The same database is used for gathering data on agricultural employment and self-employment as shares of total employment; these work categories serve as proxies for informal employment, as they have been argued to be closely associated with last resort, low-productivity jobs in the region, thus masking a situation of worsening underemployment and predominant subsistence farming (Svejnar 1999; Alam et al. 2005). As yet another employment measure, we use two employment-to-population ratios: the first is drawn from the ILO-KILM database, and employment-to-population ratio for individuals aged 15-59 was obtained from the TransMONEE 2006 Database.

[21] Moreover, the comparisons of descriptive statistics between SHI and non-SHI countries presented in Table 2 cannot be strictly interpreted as a preliminary assessment of SHI effects, because eventual SHI adoptions occurred on a staggered basis in our sample.

[22] Table 10 in the Appendix contains the full definitions and sources for all our labor outcome variables.

Data on informal employment or the size of the informal economy are not readily available for transition countries. Although there are rough estimates provided by ILO and some national statistical offices, their reliability and comparability across countries is not guaranteed and they are available for only a few countries in our sample. However, there have been some attempts in the literature to estimate at least the size of the informal economy using indirect approaches, focusing on various macroeconomic and institutional indicators which are argued to be linked with the evolution of the informal sector. We follow the approach proposed by Kaufmann and Kaliberda (1996) and Johnson et al. (1997) and measure the size of the informal economy by comparing official measures of annual GDP growth with total electricity consumption growth. The basic assumption is that electricity consumption is closely related to overall economic activity, with a short-run electricity-GDP usually close to one; hence, the annual growth in electricity consumption represents a good proxy for the total (formal plus informal) GDP growth in a given year. If this is the case, rough estimates of the informal GDP can be obtained simply by calculating the difference between the estimated total GDP and the official GDP measure. This simple calculation method avoids important the endogeneity problems likely to be found in estimates coming from modeling approaches which derive the size of the informal economy from economic and institutional variables.

The method is not free from criticisms, of course. The assumption of unitary electricity-GDP elasticity has been criticized mainly on the grounds that (i) technical progress over time has made electricity use more efficient than in the past, (ii) higher electricity prices reduce electricity consumption per unit of output, and (iii) many informal activities are not electricity-intensive, such as in the services sector. For these reasons, we also follow Kaufmann and Kaliberda and Johnson et al. and depart from the unitary elasticity assumption, considering three different groups of transition countries identified in previous related research: “energy-efficient” economies (Central and Eastern European countries) which are assumed to have an electricity-GDP elasticity of 0.9 with a growing economy; “energy-neutral economies” (the Baltic countries), assumed to have unitary elasticity; and “energy-inefficient” economies (the rest of the former Soviet republics), assumed to have an elasticity of 1.15 when GDP is growing. We use data on electricity output and official GDP for 17 ECA countries in order to obtain annual estimates of the size of the informal economy for the period 1990-2003. As baseline data, we use the same values as Johnson et al. (1997) for the initial (i.e. 1989) shares of the informal sector in those countries.

In our sample, average gross wages tended to be higher in SHI countries than in non-SHI countries between 1990 and 2004; Armenia and Tajikistan exhibited the lowest averages in 2004 (less than US$150 PPP) while Croatia and Lithuania presented the highest averages in the same year (more than US$2,500 PPP). Average total unemployment rates seem to have been very similar for SHI and non-SHI countries during 1990-2004, with Hungary and Slovenia presenting rates around 6% in 2004, and Macedonia and Poland reaching at least 19% in the same year. Registered unemployment rates and employment-to-population ratios for individuals aged 15-59 indicate a somewhat worse employment situation for SHI adopters in such period. Self-employment and agricultural employment were lower on average for SHI countries; and both groups of countries presented very similar estimates for the average size of the informal economy: the Czech Republic and Slovakia exhibited averages lower than 16% in 2003, in contrast to averages higher than 41% for Azerbaijan and Georgia in that year. For two selected labor variables, unemployment rate and size of the informal economy, there seems to be a close, positive relationship between the rates of SHI adoption over time and their cross-country yearly average values in the sample, as depicted in Figure 6 and Figure 7. As in the health sector case, however, one needs to control for the observable and unobservable heterogeneity between non-adopters and eventual SHI adopters in order to attribute the differences and patterns identified above to SHI adoption.

Covariates in the estimating equation (the X*-vector)*

We are not attempting to estimate a complete model of our health sector and labor market outcomes, but rather to estimate the impact of SHI adoption. The criterion for including a variable in our X_{it} vector is whether its omission would bias our estimate of δ, our SHI impact parameter. We want to include in X_{it} therefore variables that are correlated with both our outcomes and SHI adoption.

Although evidence on the determinants of SHI adoption is scarce, it has been indicated that SHI schemes emerged first in countries with higher initial (i.e. pre-transition) per capita income levels, whilst tax-based funding prevailed in countries with lower initial per capita income (Preker, Jakab and Schneider 2002). This positive correlation between income levels and SHI status is also present in our data; thus, we include GDP per capita in our X_{it} vector[23]. This is the only variable we include among the X_{it} in the labor market model; our specification is thus similar to that of Gruber and Hanratty (1995) in their study of the employment and wage effects of the introduction of tax-financed health insurance in Canada. In our main health sector equations, we also include among the X_{it} the share of the population aged 65 or above, and the urban population as a fraction of the total. We subsequently present additional results where we include among the X_{it} dummies capturing the provider payment methods in force.

[23] The precise definition and source are indicated, along with those for other variables included in the X_{it} vector, in Table 11 in the Appendix.

Preliminary data analysis: the ‘parallel trends’ assumption

For all the generalizations of the DD approach discussed in the methods section, we will obtain unbiased estimates of SHI impacts only insofar the crucial “parallel trends” identifying assumption holds in our data, that is, only if the change in outcomes in non-SHI “control” countries constitutes an adequate representation of what the change in outcomes in SHI “treatment” countries would have been in the absence of SHI adoption. We obtain evidence that the (directly untestable) “parallel trends” assumption cannot be discarded to hold in our context through two alternative procedures. Firstly, we performed *t*-tests for both (i) baseline differences in average outcomes—year 1990—between eventual SHI countries and non-adopters (excluding from the sample countries which adopted SHI in 1990 or before) and (ii) baseline differences in average *changes* in outcomes (1990-1991) between the same groups of countries (excluding countries which adopted SHI in 1991 or before). The first test shows statistically significant differences between baseline outcomes only in a few cases, and trend differences (1990-91) occurred in even fewer cases—only four instances, namely for overall and male life expectancy, and death rates by all causes and female breast cancer.

Secondly, we ran “placebo” DD as a checking strategy: we created a false treatment dummy variable which took on the value of one for eventual SHI adopters in the sample and zero for countries that never adopted SHI, and used only 1990-1991 data (excluding countries that adopted SHI in 1991 or before) for performing a DD regression comparing years 1991 and 1990. Since there was in fact no “treatment” (SHI adoption) in either year, rejecting the null hypothesis of individual insignificance of the false treatment variable for changes in a given outcome—conditional on covariates—casts doubt on the unbiasedness of estimates obtained by DD methods for that variable. These “placebo” regressions showed significant effects for only 9 health outcomes and 1 labor outcome.[24] Taken together, the results obtained by the two alternative exploratory procedures offer support to the assumption of "parallel trends" between SHI and non-SHI countries for the vast majority of health and labor outcomes; however, these tests are of indicative nature only, due to the small sample sizes used as a result of restricting the analysis to years 1990 and 1991. An additional test for endogeneity in the context of our models based on DD generalizations is performed in the next section.

5. Results: health sector outcomes

We first report the results for the impact of SHI on health sector outcomes. For both our health and labor analyses, we first jointly present the estimation results for the SHI dummy models with country-specific effects only (eqn (2) estimated by OLS) and under the random trend specification, i.e. with both country-specific effects and trends (eqn (4) estimated by fixed effects). Next, we test for the possible endogeneity of the SHI status variable in the context of our more general DD-based specification—the random trend model—for the case of each outcome; for those cases where SHI appears to be endogenous even after country-specific effects and trends are taken into account, we then present the results obtained by implementing our IV strategy on the model in levels given by eqn (5).

Results for the models based on generalizations of the DD approach

Table 4 presents the results for both the SHI dummy specification with country-specific effects only and for the random trend specification. For only 12 of the 71 outcome indicators

[24] The false treatment dummy had a significant positive effect (at a 10% level) on neonatal mortality rate and measles incidence, and negative effects on the share of government health spending absorbed by salaries, postneonatal mortality rate, death rates by diarrhoea, liver diseases and smoking-related causes, syphilis incidence and mumps immunization rate. In the labor models, a 10% significant effect (negative) was found only for TransMONEE's employment-to-population ratio.

included in Table 4 is there any evidence of a significant impact of SHI. This itself is noteworthy—the impacts of SHI are limited to just a few health sector outcome variables.

Overall, the results obtained by using our random trend model are similar to those obtained through the specification with country-specific effects only, both in terms of the sizes and significance levels of individual coefficients. However, country-specific trends seem to be important in explaining the evolution of health outcomes. We estimated our random trend specification using a least-squares dummy variables approach and tested the joint insignificance of the g_i terms in eqn (4) through *F*-tests; according to the results (not shown), the joint insignificance of the g_i terms is strongly rejected in all models, with p-values smaller than 0.0001. For this reason, we consider the more general random trend specification to be preferred to our simplest model without country-specific trends, even though the results coming from both models lead generally to the same conclusions.[25]

Table 4 suggests that SHI has significantly raised per capita health spending, by about 12% or US$47 PPP in 2000 prices. The increase in government health expenditures per capita—of about 15% or US$45 PPP—seems to have accounted for almost the entire raise in total spending during the period, with no significant effects found on private health expenditures. The impacts on total and government health spending are reduced to about 8% and 12% (respectively) when we switch to the alternative "non-classical" definition of SHI for Latvia, Poland and Romania, where we classify the first two countries as SHI countries despite the fact they do not meet the strict definition of SHI, and Romania as SHI from 1992 onwards even though it was not until 1998 that Romania set up a formal mandatory SHI system. This reduction

[25] Since the random trend specification is estimated using a fixed effects estimator, which gives consistent parameter estimates even if the regressors are correlated with the individual effects, using this model allows us also to control for the potential correlation between SHI adoption and country-specific (linear) trends in health outcomes.

of impact when the definition is changed provides additional evidence that SHI—interpreted strictly—does indeed increase health spending.[26]

Whether the additional spending resulting from a transition to SHI is a good or bad thing cannot be said without seeing what the extra resources buy. A second result that emerges from Table 4 is that SHI has significantly increased the share of health spending going on wages and salaries, with the mean impact being of the order of around 16%, equivalent to a mean increase in the share of spending going on wages and salaries of around 6 percentage points. We must interpret the latter result with caution, however, due to the reduced number of changes in our SHI dummy used to identify the parameters of the random trend-fixed effects specification in this case.

The transition to SHI has *not* been associated with statistically significant improvements in health outcomes. The one exception is the 8% reduction in post-neonatal mortality, although there is a contradictory positive and significant impact of about 9% in one of the infant mortality rate measures. Nevertheless, according to the estimates for the vast majority of our indicators, SHI adoption does not seem to have caused either general improvements or adverse effects on population health status.

Our results also point to SHI impacting on hospital activity rates, capacity utilization and the quality of care. Table 4 suggests that SHI reduced average total length of stay and increased the bed occupancy rate. However, the impacts are small in magnitude, between 2-3% over the sample average. We also find significant increases on in-patient admissions both overall and in

[26] Similarly, for all the remaining models estimated in this paper, using the alternative definition of the SHI variable does not alter our qualitative results and only marginally affects the size of our parameter estimates in some instances.

acute care hospitals of about 2% and 4%, respectively. There is evidence of a significant positive impact on discharges for patients treated for cerebrovascular diseases (an increase of around 4%), but only weak evidence of an impact on discharges by infectious diseases (11% increase in the model without random trend). Finally, we find evidence of a sharp reduction in the surgical infection rates due to SHI adoption, but again the reduced number of switches of the SHI dummy in the sub-sample used to estimate this model suggests caution in interpreting such result as a strong indication of improved hospital care quality under SHI systems.

Endogeneity of SHI vis-à-vis health sector outcomes

Our estimation method allows for time-invariant unobservables and time-varying unobservables (albeit ones that follow a linear trend) to be correlated with both our health sector outcomes and SHI adoption. It might, however, be argued that this does not properly capture the possible endogeneity of SHI. It might be that SHI was adopted precisely in response to changes in one or other of our health sector outcomes—falling health spending or rising mortality, for example. An informal yet very informative test of reverse causality proposed by Gruber and Hanratty (1995) in a similar modeling exercise is to include in the model a lead dummy variable indicating whether SHI will be adopted the following year. If causality goes from SHI to the outcome variable, the coefficient on the lead dummy will be zero. A nonzero coefficient would point towards causality running the other way or some other type of endogeneity that cannot be captured by eqn (3).

We adopted this approach in the SHI dummy random trend model for all the health outcomes. The coefficient on the lead dummy turned out to be significant at the 10% level in only two of the 71 models, namely those for measles immunization rate and length of stay in acute care hospitals, and none was significant at the 1% level. For most outcomes, the insignificance of the lead SHI dummy could not be rejected with fairly high associated p-values. The inclusion of country-specific effects and trends seems therefore to control for the potential reverse causality between health outcomes and SHI adoption in our data.

Results for the instrumental variables (IV) approach

Since our earlier estimated impacts do not seem to be attributable to endogeneity, and thus we can be more confident in that we are estimating causal effects in our random trend specifications, we present in Table 5 the results of our IV estimations only for the two outcomes for which the SHI dummy appears to be endogenous in the random trend specifications—measles immunization rate and length of stay in acute care hospitals. The model in levels given by eqn (5) is estimated by two-stage least squares (2SLS) and by the two-step generalized method-of-moments (GMM), in order to achieve a balance between the results less likely to be affected by small sample bias, as it is the case for the 2SLS estimates, and the results obtained by the more efficient GMM method. According to the results in Table 5, our two instruments—the SHI dummy lagged one period and our indicator for SHI existence prior to communism—have very good explanatory power for the values assumed by SHI_{it}, with the joint insignificance of the instruments set in the first stage regressions being strongly rejected by F tests. However, it is only for the measles immunization rate model that Hansen's tests of overidentifying restrictions cannot reject the joint null hypothesis that our two instruments are uncorrelated with the error term and that such instruments are correctly excluded from the estimated equation.[27] Thus, based on our IV estimates, SHI adoption did not have any effect on this remaining immunization

[27] For length of stay in acute care hospitals, replacing our indicator of SHI prior to communism by the second lag of the SHI dummy in the instruments set (thus using $SHI_{i,t-1}$ and $SHI_{i,t-2}$ as instruments, so we have two instruments again and can implement Hansen's test) does *not* lead to non-rejection of the null hypothesis in a new test for instruments' exogeneity. This suggests that, for this outcome, it is the use of lagged values of the SHI dummy as instruments based on the weak exogeneity assumption that may not be valid after all.

measure either, and no reliable conclusions can be drawn as far as our measure of length of stay in acute care hospitals is concerned.[28]

Investigating the robustness of our basic results: SHI adoption and embedded institutional reforms

As noted in section 2, SHI adoption is often (though not always) associated with a change in the way hospitals are paid, from budgets to either FFS or PBP. From an empirical point of view, it might be argued that our estimates of the impacts of SHI adoption are simply picking up the effects of provider payment reforms rather than the impact of SHI adoption *per se*. For example, our positive impact on health spending might be argued to derive from the fact that many SHI adopters switched from budgets to FFS, often sticking with FFS even now. We investigate the possibility our results reflect concurrent shifts in provider payment methods, focusing on the timing of changes in hospital payment methods.[29] To do so, we modify our preferred random trend specification—eqn (3)—by adding to the X_{it} vector dummies for FFS and PBP ("fixed budgets/block grants" is the reference category).[30]

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[28] We estimated the IV models for all our outcomes as a way of assessing the robustness of the results obtained through our preferred random trend specification. In broad terms, our two instruments have very good explanatory power concerning the SHI variable and the null of exogeneity cannot be rejected—according to Hansen's tests—for the vast majority of health outcomes. The IV results (available from the authors upon request) provide general support to the main conclusions derived from the random trend models; for instance, positive and significant effects are found on total health expenditures per capita (14% or US$57 PPP) and no effects are generally found on mortality, incidence of diseases or immunization measures. However, as expected, fewer significant results are found in the IV specifications than in the random trend models due to the substantial increase in standard errors even when GMM is used (random trend standard errors are typically multiplied by a factor of four when IV is performed). Taking this IV feature into account, point estimates suggest that SHI may have had an even larger positive effect on the share of wages and salaries than previously estimated—of around 22%, with an associated p-value of 0.117. The results are inconclusive concerning length of stay and hospital admissions measures due to the rejection of the null hypothesis in Hansen's tests for the validity of the instruments set.

[29] We would like to have expanded the scope of this part of the analysis to cover other potentially relevant changes that may have been associated with SHI adoption, such as changes to the way primary care providers were paid, the introduction of a gate-keeping function for primary care providers, and so on. We were unable, however, to get the relevant data, year by year. At best, we could obtain typically only snapshots of the initial (i.e. communist) and current arrangements, with no information on the *timing* of these changes over the decade.

[30] Table 12 in the Appendix presents the detailed timing of changes in predominant hospital payment methods for the countries in our sample. As it can be noticed, SHI adoption and a change in the predominant hospital payment method have occurred in the same year for some countries, e.g. Bulgaria, Czech Republic, Estonia, Kyrgyz Republic and Macedonia.

Overall, the new results presented in Table 6 offer support to our previous finding that SHI adoption increased per capita health spending. Even after including the payment methods dummies, we find that SHI led to an increase in annual government health care expenditures per capita of around 11% or US$33 PPP in the "adopter" countries, compared to what would have occurred had these countries not switched to SHI. This estimated effect is only 4 percentage points smaller than that obtained from our original random trend specification (i.e. without the payment dummies) and is significant at the 5% level. Interestingly, while the coefficients on FFS and PBP are the expected sign, neither is significant. The results suggest, in other words, that SHI adoption of itself increases government health spending, while switching from budgets to either FFS or PBP does not of itself change government health spending per capita. Interestingly, our results suggest that *private* spending on health is sensitive to the way hospitals are paid, with FFS being associated with significantly higher private spending. The magnitude is sizeable: an increase of 34% or US$36 PPP per capita.

As far as health outcomes are concerned, there was little evidence in our original specification of SHI adoption having any impact, and this remains the case even after including provider payment method dummies. The latter have a few significant coefficients but there is no consistent pattern. As far as hospital indicators are concerned, the results in Table 6 confirm that quality of care as measured by surgical infection rates has markedly improved as a result of SHI adoption. The new estimated increase in the bed occupancy rate due to SHI is similar to the original estimate (3.5%). By contrast, the impact of SHI on acute care hospital admissions is somewhat smaller when the provider payment method dummies are included among the X_{it} (2.5% compared to 3.7%). This reduction is due to FFS having an independent positive impact on admissions, and the introduction of FFS being correlated with the adoption of SHI. In our new results, SHI no longer has an impact on length of stay, though neither does the way hospitals are paid.

Overall, our basic empirical conclusions seem fairly robust to the inclusion of changes in hospital payment methods as potential confounders of SHI impacts.[31] In particular, SHI adoption *per se*—i.e., without any change in payment methods—is still found to lead to higher government health spending, bed occupancy rates and (acute care) hospital admissions, but no improvements on population health indicators.[32]

6. Results: labor market outcomes

In this section we report our results for the impact of SHI on labor market outcomes. The format follows that of the previous section.

Results for the models based on generalizations of the DD approach

Among the eight outcomes studied, in only one case do we see a significant impact, namely for the average gross wage rate (Table 7).[33] The coefficient is positive and its point estimate is remarkably similar in the models with and without random trend; it implies an

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[31] We implemented the "lead SHI dummy" test for reverse causality in the context of this new specification as well; the lead SHI dummy is found to be significant at the 10% level in only four instances—measles and mumps immunization rates, hospital discharges by respiratory diseases and length of stay in acute care hospitals. For the latter outcome, our IV models (results not shown) lead to inconclusive results due to the rejection of the null hypothesis of instruments' exogeneity in Hansen's tests.

[32] The estimated coefficients on hospital payment methods are of course very interesting by themselves, not least because in practice it has been mostly SHI countries that have abandoned budgets as the predominant arrangement in our sample; however, since an analysis of the influence of provider payment methods on health indicators is not the primary aim of this paper, we only briefly comment on these results here. As it can be seen in Table 6, in addition to the substantial, positive effect of fee-for-service on total and private health care spending per capita, this arrangement is also found to decrease the length of stay in acute care hospitals and increase the number of inpatient admissions and hospital discharges, suggesting that providers are given the incentives for using resources more intensely under such payment method. Also noteworthy is the finding that neither fee-for-service nor SHI *per se* induce hospital downsizing in terms of the normally excessive beds supply inherited from the communist system, though switching from budgets to patient-based payment methods seems to provide some incentive for it.

[33] The models for labor market outcomes are estimated using the natural logarithm of the dependent variable.

increase of around 20% in the average gross wages and salaries after SHI adoption in a given country. We find no evidence in Table 7 of SHI significantly increasing unemployment or reducing employment; nor do we find any effects of SHI adoption on either the informal economy measure or our informal employment proxies (self-employment and agricultural employment as shares of the total).

Endogeneity of SHI vis-à-vis labor market outcomes

We undertook the same type of informal test for endogeneity discussed above for the health sector outcome variables. The coefficient on the lead SHI dummy was significant at the 5% level for two of the outcomes: registered unemployment rate and TransMONEE's employment-to-population ratio. Moreover, the coefficient for the lead SHI dummy was significant at the 10% level for our measure of the size of the informal economy. These results suggest that the statistical insignificance of at least some of the SHI impacts estimated in our previous models might be due to endogeneity. Therefore, in contrast to what we found for the health outcomes, endogeneity seems to be a reason for concern in our labor models, and we tackle this issue by implementing our IV methods in what follows.

Results for the instrumental variables (IV) approach

The results for the registered unemployment, TransMONEE's employment-to-population ratio and informal economy models estimated by 2SLS and GMM are reported in Table 8.[34] As for the health outcomes, the two instruments used seem to be extremely relevant for all labor models, with partial *F* statistics above 250. Additional tests (not shown) confirm that our instruments are relevant and strong in the context of these labor models: for the three cases,

[34] As in the random trend specification, the IV models are estimated using the natural logarithm of the dependent variable at the left-hand side.

Anderson canonical correlations likelihood ratio tests firmly reject the null of model underidentification—with associated p-values smaller than 0.001—and Cragg-Donald *F*-tests (Stock and Yogo 2002) strongly reject the null of weak instruments (*F* statistics above 200). Furthermore, according to the results of the Hansen tests for overidentifying restrictions, our excluded instruments are found to be exogenous for the models with the three outcomes as dependent variables (p-values larger than 0.47). Thus, for the three labor models where we found evidence of endogeneity in our random trend specification, it seems safe to base our conclusions entirely on the IV results, since there is evidence that the latter models provide reliable parameter estimates for such cases.

Again as expected, GMM estimates are more efficient than the 2SLS ones, but even GMM standard errors turn out to be four times larger on average than the random trend estimates. Despite such large inflation in standard errors, the IV estimates provide evidence that the lack of significant SHI impacts found in the previous models on two employment indicators, the registered unemployment rate and TransMONEE's employment-to-population ratio, was due to endogeneity. Positive and strongly significant impacts on registered unemployment rates are reported in both the 2SLS and GMM columns of Table 8, suggesting that SHI adoption doubles this unemployment measure. Although no effect was found on the total unemployment rate in the random trend models, 2SLS estimations show some evidence that SHI adoption has led to a deterioration of employment levels as measured by TransMONEE's employment-to-population ratio: the point estimate is significant at the 10% level and implies a decrease of around 10% or 6.7 percentage points in this indicator in response to SHI adoption. A similar point estimate, very close to the 10% level of statistical significance, is found in the GMM estimations. Finally, there is once more no evidence of a SHI impact on the size of the informal economy.

7. Discussion and conclusions

The health system reforms the European and Central Asian (ECA) countries implemented during their transition from socialist economies in the 1990s provide a unique opportunity to assess the impacts of social health insurance (SHI) on the health and labor sectors. We took advantage of this highly unusual "experiment" in which many ECA countries unequivocally switched from general tax-funded to SHI systems in a relatively short period of time, and on a staggered basis, so as to shed light on two broad sets of currently unanswered questions: firstly, how does SHI affect national health spending, the way such resources are spent, and population health outcomes? Secondly, how does SHI impact national employment levels and informalization of the economy? In order to obtain empirical evidence on these issues, we have used regression-based generalizations of the differences-in-differences approach and instrumental variables (IV) methods on panel data from 28 ECA countries for the period 1990-2004.

Overall, there is reliable evidence that our empirical methods have allowed us to successfully control for the possible endogeneity of SHI adoption, and therefore that we have identified causal relationships between SHI adoption and outcomes. This supporting evidence comes from a variety of sources. In the first place, our random trend specifications control for any time-invariant country-specific unobservables that may be simultaneously correlated with SHI adoption and outcomes, and also control for country-specific linear trends in these unobservables over time. Second, diagnostic checks show that we cannot rule out the validity of the "parallel trends" assumption for the majority of the outcomes analyzed in this paper, thus conferring credibility on the parameters obtained from our random trend models (which use the evolution of outcomes in non-SHI countries as the counterfactual for countries that adopted

SHI). Third, the results from an informal test for endogeneity in the random trend models suggest that reverse causality—that is, countries switching to SHI *because* of the evolution of their outcomes—is not present in the context of our health sector analysis. Finally, a battery of tests show that our IV models are well suited to the task of controlling for the potential endogeneity of SHI adoption identified in the random trend models for some important labor outcomes, thus providing reliable parameter estimates for the causal effect of SHI adoption in such cases.

Our estimates suggest that SHI adoption *per se* increased government health expenditure per capita. We also obtain some evidence that part of the extra financial resources available in the health sector due to SHI adoption have served to increase the fraction of salaries as percentage of government health spending in SHI countries. This result provides quantitative evidence in support of claims about the process of transition to SHI in some ECA countries being favored and accelerated by pressure from health professionals, who expected to have their income levels driven up by the introduction of a SHI system.[35] Although SHI has impacted on how physical resources are used through a reduction in the average hospital length of stay and increases in hospital admissions and bed occupancy rates after SHI adoption, only one indicator—the surgical infection rate—suggests a (large) improvement in the quality of hospital care for SHI systems. Even though SHI systems ended up spending more on health care than their tax-funded counterparts, our analysis of several mortality and morbidity indicators showed that transition to SHI has *not* caused general improvements in health outcomes for ECA countries.

[35] See, for instance, the individual WHO-*HiT* reports for the Czech Republic and the Russian Federation.

These results are mostly robust to the inclusion of dummy variables capturing shifts in provider payment methods alongside the SHI status dummy; they are therefore pure SHI effects. For example, the higher government spending caused by a transition to SHI is not a spurious result attributable to the fact that some countries switched to fee-for-service (FFS) when they adopted SHI. We are able to estimate separate provider payment effects because SHI adoption did not always lead to provider payment reform and even when it did sometimes did so with a lag, because some non-SHI countries reformed the way they paid hospitals as well, and because some SHI countries switched provider payment methods more than once (some, for example, switched to FFS only to change to a patient-based payment method (PBP) later on). Typically, where we find an impact of provider payments on our outcomes we do not find an impact of SHI adoption, and vice versa. For example, private health spending is affected (positively) by a switch to FFS but not by SHI adoption, while government spending is (positively) affected by SHI adoption but not by how hospitals are paid. An exception is acute care admissions, which respond positively to both SHI adoption (a 2.5% increase) and a switch to FFS (a 3% increase). The impact of SHI adoption on acute care admissions was thus greater in countries where SHI adoption was associated with a switch to FFS than in countries where SHI adoption did not coincide with a provider payment reform.

The question arises: Why did health outcomes not improve as a result of SHI adoption even though it led of itself to higher government health spending and higher acute in-patient admissions? One part of the explanation is that the percentage increase in admissions was much smaller than the percentage increase in spending (2.5% compared to 11%). Much of the extra spending therefore resulted in more costly admissions and/or extra spending elsewhere in the health system. Part of the story seems to be the higher salary share of costs as a result of SHI adoption. But it also seems likely that costs were incurred undertaking new activities (e.g. collecting contributions, writing contracts with providers) or that existing activities became more costly (e.g. more tests being administered on in-patients, more expensive drugs being given, etc.). It is also possible that SHI adoption may have resulted in less comprehensive and less well integrated public health and prevention programs (cf. e.g. Allin et al. 2004), and that the extra admissions and extra costs caused by the transition to SHI were incurred in treating additional patients who would not have otherwise become sick. The fact that SHI adoption appears to have led to increased numbers of infectious disease hospital discharges (Table 6) is consistent with this story. Gaps in coverage may also be part of the explanation. Some groups seem to have fallen through the coverage net, such as the Roma population (cf. e.g. Rechel and McKee 2003), and there is anecdotal evidence that some formal sector workers wait to enroll until they get sick. Because of lack of coverage, these groups may use primary care less than they would have otherwise done, increasing the likelihood illness is left untreated until serious enough to warrant hospitalization. Some of the extra hospital caseload associated with SHI may therefore simply be due to people waiting until they get so sick that they require hospitalization.

As far as the relationship between SHI adoption and the labor market is concerned, our work offers some empirical support to the alleged damaging effect of SHI on employment levels. We find that *registered* unemployment rates doubled in SHI countries compared to what the rates would have been if those countries had not adopted SHI. In spite of the sizeable magnitude of this effect, this result is not corroborated by a commensurate increase in *total* unemployment rates. We do, however, find corroborating evidence of a negative impact of SHI adoption on employment from our estimated negative impact of SHI on the employment-to-population ratio of people aged 15-59. SHI is also estimated to have strongly increased average *gross* wages and salaries in the formal sector. On the other hand, transition to a SHI system did not cause an increase in the size of the informal sector of the ECA countries according to our—admittedly fallible—measures of informality. There is also no evidence that SHI adoption led to an increase on informal employment in SHI countries of the region.

Of course, our results do not necessarily imply that SHI adoption everywhere must necessarily reduce employment, and raise health spending without improving health outcomes. The latter pair of results in particular is likely to hinge in part on the fact that SHI was introduced with costly institutional reforms but ones that did little to stimulate the performance of the health system. Nonetheless, the largely negative results in the paper ought to serve as a warning to those contemplating shifting from general revenue finance to SHI.

Table 1: Definitions of SHI status in the dataset

Country	Year of SHI adoption	SHI dummy	Comments
Albania	1995	=1 1995 onwards =0 beforehand	
Armenia	Never	=0 throughout	
Azerbaijan	Never	=0 throughout	
Belarus	Never	=0 throughout	
Bosnia and Herzegovina	Prior to 1990	=1 for 1991 Missing 1992-96 =1 1997 onwards	SHI in place prior and (in theory) during the to 1992-95 war, but war period excluded from analysis
Bulgaria	1999	=1 1999 onwards =0 beforehand	
Croatia	Prior to 1990	=1 1990 onwards	
Czech Republic	1993	=1 1993 onwards =0 beforehand	
Estonia	1992	=1 1992 onwards =0 beforehand	
Georgia	1995	=1 1995 onwards =0 beforehand	
Hungary	1990	=1 1990 onwards	
Kazakhstan	1996	=1 1996-1998 =0 otherwise	Abandoned SHI in 1998
Kyrgyz Republic	1997	=1 1997 onwards =0 beforehand	
Latvia	Never	Option 1: =0 throughout Option 2: =1 1997 onwards, 0 otherwise	Latvia set up SHI agency before 1997 but it was funded through general revenues. Since 1997, 28.4% of income taxes are earmarked for health
Lithuania	1991	=1 1991 onwards =0 otherwise	
Macedonia, FYR	1991	=1 1991 onwards =0 1990	
Moldova	Never	=0 throughout	
Poland	Never	Option 1: =0 throughout Option 2: =1 1999 onwards, 0 otherwise	Health system funded not through payroll tax but earmarked income tax
Romania	1998	Option 1: =1 1998 onwards, 0 otherwise Option 2: missing 1990-91 =1 1992 onwards	Earmarked payroll taxes were established in 1992 (2% of payroll)
Russian Federation	1993	=1 1993 onwards =0 beforehand	
Serbia and Montenegro	Prior to 1990	=1 throughout	
Slovak Republic	1995	=1 1995 onwards =0 beforehand	
Slovenia	1992	=1 1992 onwards =0 beforehand	
Tajikistan	Never	=0 throughout	
Turkey	Prior to 1990	=1 throughout	Two out of the three main insurance funds collect payroll-based earmarked contributions for health and cover approximately 87% of the population
Turkmenistan	Never	=0 throughout	WHR has social security spending ranging from 6.1-9.9%.
Ukraine	Never	=0 throughout	
Uzbekistan	Never	=0 throughout	

Table 2: Descriptive statistics for health sector outcome variables

	Full sample			SHI = 1			SHI = 0		
	Mean	SD	Obs	Mean	SD	Obs	Mean	SD	Obs
Health expenditures - Total	402.83	296.92	359	536.16	325.16	186	259.47	172.88	173
Health expenditures - Government	295.87	249.61	324	404.22	281.52	167	180.62	136.89	157
Health expenditures - Private	101.26	71.77	324	123.91	72.54	167	77.16	62.69	157
Salaries (%)	39.41	12.63	168	40.24	16.62	69	38.82	8.95	98
Physicians	2.97	0.93	343	2.72	1.01	158	3.20	0.79	184
Life expectancy	70.49	2.91	380	71.52	3.03	181	69.55	2.45	198
Life expectancy (male)	66.41	3.51	377	67.53	3.76	178	65.39	2.92	198
Life expectancy (female)	74.64	2.65	377	75.64	2.61	178	73.73	2.36	198
Under-5 MR (TransMONEE)	21.59	13.07	383	15.95	8.19	179	26.58	14.51	203
Under-5 MR (WHO)	21.12	13.05	366	15.37	7.73	167	25.99	14.61	198
Infant MR (WB)	20.22	19.66	231	13.25	11.10	127	28.95	24.25	102
Infant MR (TransMONEE)	17.10	9.48	399	13.24	6.57	181	20.40	10.42	212
Infant MR (WHO)	16.95	9.57	379	14.31	9.29	179	19.29	9.25	198
Perinatal MR	12.40	4.74	352	10.91	5.25	161	13.64	3.87	191
Neonatal MR	7.78	3.00	296	7.35	3.34	154	8.24	2.51	141
Postneonatal MR	7.31	6.29	295	4.89	3.18	154	9.99	7.66	140
Maternal MR	28.46	21.78	383	23.05	23.01	178	33.27	19.51	204
Maternal MR (3-year)	28.65	18.88	349	21.94	17.12	156	34.16	18.55	192
Caesarean sections	92.77	50.10	331	118.53	43.52	154	70.35	44.43	177
SDR all causes	1145.92	184.92	366	1081.83	182.81	167	1200.68	169.12	198
SDR infeccious diseases	17.16	15.31	363	11.81	10.25	167	21.77	17.37	195
SDR tuberculosis	9.84	8.02	361	7.57	8.23	167	11.80	7.33	193
SDR diarrhoea (under 5)	31.38	67.31	354	11.82	22.38	166	48.92	86.59	187
SDR ARI (under 5)	105.48	145.38	342	46.61	66.83	167	162.47	175.26	174
SDR heart disease	302.88	129.88	363	239.05	109.83	167	358.58	119.68	195
SDR liver diseases	29.41	21.36	321	26.16	18.02	151	32.39	23.66	169
SDR diabetes	14.92	8.59	363	14.35	6.91	167	15.39	9.81	195
SDR circulatory diseases	623.62	125.33	363	576.83	120.03	167	664.11	115.85	195
SDR cerebrovascular diseases	175.36	53.23	363	171.89	55.21	167	178.57	51.46	195
SDR neoplasms	172.78	47.55	363	190.83	45.72	167	157.40	43.72	195
SDR female breast cancer	21.58	6.68	363	24.52	5.70	167	19.11	6.46	195
SDR respiratory diseases	68.31	34.93	363	54.13	27.91	167	80.59	35.80	195
SDR bronchitis	30.99	19.57	350	25.36	19.93	161	35.85	17.99	188
SDR digestive diseases	48.09	22.90	363	44.73	20.10	167	51.03	24.76	195
SDR alcohol causes	134.83	57.24	321	123.72	57.61	155	145.75	54.78	165
SDR smoking causes	542.38	167.07	321	466.26	131.64	155	615.31	164.40	165
Tuberculosis incidence rate	52.88	31.90	416	50.41	33.97	201	54.98	29.76	213
Hepatitis incidence rate	141.31	170.91	320	67.66	83.37	148	205.37	199.84	171
Hepatitis B incidence rate	17.23	19.29	384	10.38	9.61	178	23.24	23.26	205
Measles incidence rate	13.31	26.96	415	10.33	23.45	200	16.17	29.76	213
Mumps incidence rate	54.72	76.49	390	37.95	58.73	182	69.63	86.83	207
Syphilis incidence rate	31.77	52.15	381	28.21	55.82	180	35.14	48.61	200
Congenital syph incidence rate	0.16	0.30	218	0.23	0.40	88	0.11	0.18	129
Pertussis incidence rate	4.05	5.62	413	4.33	6.78	199	3.78	4.27	213

	Full sample			SHI = 1			SHI = 0		
	Mean	SD	Obs	Mean	SD	Obs	Mean	SD	Obs
Diphteria incidence rate	1.31	5.19	415	0.67	2.94	200	1.93	6.61	213
Tetanus incidence rate	0.09	0.11	407	0.11	0.12	196	0.07	0.09	210
Cancer incidence rate	245.01	147.37	335	318.21	159.21	138	193.72	113.47	197
Tuberculosis immunization rate	92.70	11.32	420	93.10	10.39	201	93.24	9.93	213
DPT immunization rate	91.59	9.75	420	91.90	7.67	201	91.87	10.31	213
Measles immunization rate	91.22	9.80	420	91.57	8.57	201	91.70	9.45	213
Polio immunization rate	92.06	8.81	420	91.94	7.76	201	92.82	8.69	213
Mumps immunization rate	82.25	22.69	227	88.63	16.39	127	74.59	26.50	99
Rubella immunization rate	88.00	19.23	190	90.05	15.52	124	85.29	22.78	65
Length of stay (total)	12.75	3.04	398	11.23	2.93	193	14.19	2.39	204
Length of stay (acute care)	10.87	2.71	267	9.40	2.37	150	12.78	1.79	116
Bed occupancy rate	72.80	14.78	278	74.85	9.82	149	70.36	18.78	128
Hospital beds	8.10	2.91	342	6.72	2.59	155	9.28	2.64	186
In-patient admissions	16.18	5.99	397	15.51	6.02	194	16.86	5.90	202
Acute care admissions	15.16	5.39	277	15.17	5.5	150	15.20	5.26	126
Hospital discharges - infectious	826.10	444.11	353	658.64	352.78	170	981.66	464.08	183
Hosp discharges - cancers	809.34	588.59	346	1068.85	643.08	163	578.19	417.81	183
Hosp discharges - heart	669.00	468.43	343	684.00	425.49	163	655.41	504.97	180
Hosp discharges - circulatory	1904.45	1099.73	354	2092.45	1152.72	170	1730.76	1021.10	184
Hosp discharges - cerebrov	339.11	240.51	350	394.82	243.94	168	287.68	226.04	182
Hosp discharges - respiratory	2088.68	1014.24	351	1737.75	778.42	170	2418.28	1098.08	181
Hosp discharges - digestive	1623.59	626.99	354	1544.75	579.86	170	1696.44	660.83	184
Hosp discharges - musculo	776.92	508.15	354	809.35	536.77	170	746.96	479.71	184
SDR appendicitis	0.30	0.18	347	0.23	0.14	158	0.36	0.19	188
SDR hernia & intestinal	2.23	0.75	350	2.34	0.74	161	2.14	0.74	188
SDR adverse effects	0.20	0.33	183	0.19	0.33	116	0.19	0.28	66
Surgical infection rate	1.09	1.22	74	0.92	0.82	42	1.30	1.59	32

Note: Mean, standard deviation (SD) and number of observations (Obs) for the full sample and for the sub-samples of observations with the SHI dummy equals to one (SHI=1) and zero (SHI=0).

Table 3: Labor market outcome variables: descriptive statistics

	Full sample			SHI = 1			SHI = 0		
	Mean	SD	Obs	Mean	SD	Obs	Mean	SD	Obs
Gross wage	1115.49	876.72	257	1555.22	921.52	119	736.31	626.16	138
Unemployment	11.68	5.91	229	11.66	6.16	162	11.73	5.29	67
Registered unemployment	9.27	8.26	295	12.98	9.11	141	5.87	5.56	154
Empl-to-pop - ILO	51.39	6.31	150	51.22	5.96	110	51.86	7.25	40
Empl-to-pop - TransMONEE	67.31	9.00	360	64.54	9.12	158	69.47	8.30	202
Informal economy	21.82	21.07	238	22.35	19.94	93	21.49	21.82	145
Self-employment	17.24	9.26	190	16.13	8.85	132	19.77	9.73	58
Employment in agriculture	25.26	16.64	268	23.07	18.93	162	28.61	11.64	106

Note: Mean, standard deviation (SD) and number of observations (Obs) for the full sample and for the sub-samples of observations with the SHI dummy equals to one (SHI=1) and zero (SHI=0).

Table 4: Basic results: health sector outcomes

		Basic model Eqn (2) estimated by OLS				*Random trend model* Eqn (4) estimated by fixed effects				
	Dependent variable	Coef	SE	p-value	SHI impact (%)	Coef	SE	p-value	SHI impact (%)	# shifts
Health spending	Health expenditures - Total	45.87	28.07	0.114	0.113	***47.47***	***27.70***	***0.098***	***0.117***	11
	Health expenditures - Government	**45.57**	**20.66**	**0.036**	**0.150**	**45.20**	**20.53**	**0.037**	**0.149**	11
	Health expenditures - Private	0.61	13.77	0.965	0.006	2.31	12.85	0.859	0.022	11
	Salaries (%)	**4.35**	**1.55**	**0.012**	**0.111**	**6.34**	**2.17**	**0.009**	**0.162**	3
	Physicians	0.04	0.04	0.322	0.013	0.03	0.04	0.410	0.010	13
Health outcomes	Life expectancy	-0.21	0.23	0.370	-0.003	-0.24	0.22	0.297	-0.003	13
	Life expectancy (male)	-0.24	0.27	0.371	-0.004	-0.27	0.26	0.316	-0.004	13
	Life expectancy (female)	-0.15	0.16	0.374	-0.002	-0.17	0.16	0.286	-0.002	13
	Under-5 MR (TransMONEE)	0.10	0.87	0.911	0.005	-0.12	0.89	0.896	-0.006	14
	Under-5 MR (WHO)	0.92	0.69	0.195	0.045	0.81	0.67	0.241	0.039	13
	Infant MR (WB)	***1.03***	***0.50***	***0.068***	***0.092***	***0.99***	***0.50***	***0.074***	***0.089***	7
	Infant MR (TransMONEE)	0.25	0.57	0.667	0.015	0.10	0.57	0.859	0.006	14
	Infant MR (WHO)	0.40	0.49	0.429	0.024	0.37	0.48	0.446	0.023	14
	Perinatal MR	0.39	0.32	0.244	0.032	0.19	0.36	0.598	0.016	13
	Neonatal MR	0.56	0.39	0.158	0.075	0.43	0.45	0.348	0.057	10
	Postneonatal MR	***-0.46***	***0.27***	***0.099***	***-0.065***	***-0.55***	***0.27***	***0.056***	***-0.078***	10
	Maternal MR	2.59	2.08	0.225	0.091	2.80	2.15	0.206	0.099	13
	Maternal MR (3-year)	1.31	0.99	0.198	0.045	1.46	1.11	0.199	0.050	13
	Caesarean sections	-0.27	0.87	0.761	-0.003	-0.90	0.98	0.370	-0.009	10
	SDR all causes	5.96	20.82	0.777	0.005	9.37	20.95	0.659	0.008	13
	SDR infeccious diseases	1.38	1.79	0.447	0.078	1.45	1.87	0.446	0.082	13
	SDR tuberculosis	1.63	1.48	0.282	0.157	1.83	1.53	0.245	0.177	13
	SDR diarrhoea (under 5)	4.09	5.24	0.442	0.134	2.74	5.52	0.625	0.089	13
	SDR ARI (under 5)	1.63	5.00	0.747	0.016	2.25	5.43	0.683	0.022	12
	SDR heart disease	-0.36	6.01	0.953	-0.001	1.93	5.66	0.735	0.006	13
	SDR liver diseases	-0.53	1.19	0.659	-0.017	-0.25	1.14	0.828	-0.008	10
	SDR diabetes	0.66	1.29	0.615	0.044	0.89	1.33	0.509	0.060	13
	SDR circulatory diseases	-2.00	14.24	0.889	-0.003	1.79	14.49	0.903	0.003	13
	SDR cerebrovascular diseases	0.88	4.80	0.856	0.005	1.16	4.94	0.816	0.007	13
	SDR neoplasms	2.23	2.20	0.320	0.013	2.00	2.24	0.380	0.012	13
	SDR female breast cancer	0.06	0.43	0.883	0.003	0.09	0.43	0.844	0.004	13
	SDR respiratory diseases	2.03	1.85	0.283	0.029	2.23	2.00	0.276	0.032	13
	SDR bronchitis	3.68	3.47	0.300	0.118	3.62	3.67	0.334	0.116	13
	SDR digestive diseases	-0.32	1.08	0.773	-0.006	-0.06	1.03	0.953	-0.001	13
	SDR alcohol causes	-1.27	3.64	0.731	-0.009	-0.87	3.43	0.802	-0.006	11
	SDR smoking causes	1.65	13.69	0.905	0.003	1.02	14.20	0.943	0.002	11
	Tuberculosis incidence rate	-2.63	2.71	0.342	-0.048	-2.29	2.86	0.430	-0.042	14
	Hepatitis incidence rate	34.08	26.07	0.203	0.264	29.43	26.71	0.281	0.228	14
	Hepatitis B incidence rate	1.69	1.07	0.127	0.104	0.85	1.09	0.440	0.052	12
	Measles incidence rate	-5.09	7.56	0.507	-0.431	-6.53	7.55	0.395	-0.553	14
	Mumps incidence rate	4.68	8.90	0.603	0.081	4.26	9.67	0.663	0.074	14
	Syphilis incidence rate	7.38	9.77	0.457	0.201	7.69	10.58	0.474	0.209	14

	Dependent variable	*Basic model* Eqn (2) estimated by OLS Coef	SE	p-value	SHI impact (%)	*Random trend model* Eqn (4) estimated by fixed effects Coef	SE	p-value	SHI impact (%)	# shifts
	Congenital syph incidence rate	-0.01	0.02	0.704	-0.053	-0.02	0.03	0.482	-0.109	7
	Pertussis incidence rate	1.05	1.06	0.333	0.258	0.95	1.11	0.402	0.234	14
	Diphteria incidence rate	-0.05	0.68	0.936	-0.037	-0.13	0.70	0.850	-0.089	14
	Tetanus incidence rate	0.02	0.02	0.287	0.208	0.02	0.02	0.264	0.219	14
	Cancer incidence rate	2.37	3.06	0.447	0.010	-0.02	3.10	0.994	0.000	14
	Tuberculosis immunization rate	0.92	1.41	0.520	0.010	0.84	1.42	0.559	0.009	14
	DPT immunization rate	-0.40	1.17	0.738	-0.004	-0.25	1.27	0.846	-0.003	14
	Measles immunization rate	-0.24	0.55	0.661	-0.003	-0.20	0.58	0.737	-0.002	14
	Polio immunization rate	1.25	1.40	0.381	0.013	1.36	1.46	0.360	0.015	14
	Mumps immunization rate	9.69	6.55	0.155	0.116	8.32	6.98	0.248	0.100	10
	Rubella immunization rate	13.90	10.73	0.212	0.153	8.98	7.28	0.233	0.099	6
Hospitals	Length of stay (total)	***-0.32***	***0.17***	***0.063***	***-0.026***	***-0.30***	***0.17***	***0.081***	***-0.024***	14
	Length of stay (acute care)	-0.16	0.22	0.463	-0.015	-0.14	0.22	0.524	-0.013	10
	Bed occupancy rate	***1.91***	***1.06***	***0.085***	***0.026***	**2.19**	**0.99**	**0.039**	**0.030**	9
	Hospital beds	-0.17	0.19	0.371	-0.021	-0.23	0.19	0.238	-0.028	13
	In-patient admissions	**0.44**	**0.17**	**0.015**	**0.027**	***0.37***	***0.19***	***0.061***	***0.023***	14
	Acute care admissions	**0.63**	**0.20**	**0.004**	**0.042**	**0.57**	**0.21**	**0.014**	**0.037**	10
	Hospital discharges - infectious	***90.63***	***45.92***	***0.060***	***0.110***	81.85	49.06	0.108	0.099	13
	Hosp discharges – cancers	25.18	17.38	0.160	0.030	21.68	17.95	0.238	0.026	13
	Hosp discharges – heart	11.65	10.53	0.279	0.017	16.43	10.93	0.145	0.024	13
	Hosp discharges – circulatory	37.40	23.54	0.125	0.019	32.16	26.94	0.244	0.017	13
	Hosp discharges – cerebrov	***12.45***	***6.65***	***0.073***	***0.036***	***12.65***	***6.75***	***0.073***	***0.036***	13
	Hosp discharges – respiratory	96.49	60.19	0.121	0.047	86.83	69.61	0.224	0.042	13
	Hosp discharges – digestive	20.08	17.52	0.263	0.012	7.36	18.81	0.699	0.005	13
	Hosp discharges – musculo	17.74	10.60	0.107	0.022	12.93	10.43	0.227	0.016	13
	SDR appendicitis	-0.04	0.05	0.436	-0.141	-0.05	0.05	0.405	-0.156	13
	SDR hernia & intestinal	-0.16	0.11	0.172	-0.071	-0.18	0.11	0.111	-0.083	13
	SDR adverse effects	0.00	0.05	0.931	0.021	0.00	0.06	0.983	-0.006	6
	Surgical infection rate	**-1.32**	**0.41**	**0.013**	**-1.427**	**-1.38**	**0.37**	**0.006**	**-1.488**	3

Notes: Results refer to the coefficient (Coef) and standard-error (SE, cluster-adjusted) of the SHI dummy variable. Significant at **5%** and ***10%***. P-values from two-sided *t*-tests. SHI impact (%) calculated over the average outcome in the corresponding estimating sub-sample. In the last column, number of shifts refers to the number of transitions between tax-funded and SHI systems in the sub-sample used to estimate the corresponding coefficients.

Table 5: Instrumental variables results: selected health sector outcomes

	Two-stage least squares estimates				GMM estimates				Partial statistic	Hansen statistic
Dependent variable	Coef	SE	p-value	SHI impact (%)	Coef	SE	p-value	SHI impact (%)	*F*	*J*
Measles immunization rate	-2.13	1.95	0.284	-0.023	-1.95	1.90	0.316	-0.021	**555.49**	0.20
Length of stay (acute care)	**-3.25**	**1.01**	**0.004**	**-0.301**	**-3.92**	**0.97**	**0.001**	**-0.363**	**260.97**	**5.13**

Notes: For both models, the excluded instruments are the first lag of the SHI dummy and an indicator for whether SHI existed in the country prior to communism. Results refer to the coefficient (Coef) and standard-error (SE, cluster-adjusted) of the SHI dummy variable. Significant at **5%**. P-values from two-sided *t*-tests. SHI impact (%) calculated over the average outcome in the corresponding estimating sub-sample. Partial *F* statistics (cluster-robust) refer to the joint insignificance test of the subset of excluded instruments in the first stage regressions. In the last column, cluster-robust Hansen's *J* statistics for the test of overidentifying restrictions are reported, where the joint null hypothesis is that the instruments are uncorrelated with the error term and that the excluded instruments are correctly excluded from the main equation.

Table 6: Random trend results: health outcomes, SHI adoption and hospital payment methods

		SHI dummy			Hospital Payment Methods					
					Fee-for-service			Patient-based		
	Dependent variable	Coef	SE	Impact (%)	Coef	SE	Impact (%)	Coef	SE	Impact (%)
Health spending	Health expenditures – Total	19.39	22.73	0.048	**68.99**	**29.63**	**0.170**	10.99	20.02	0.027
	Health expenditures – Government	**33.49**	**16.22**	**0.111**	34.55	22.59	0.115	-7.89	30.06	-0.026
	Health expenditures – Private	-14.93	15.67	-0.141	**36.22**	**14.55**	**0.342**	19.99	18.88	0.189
	Salaries (%)	7.19	5.71	0.180	1.47	2.32	0.037	-2.48	6.12	-0.062
	Physicians	0.03	0.04	0.011	-0.02	0.06	-0.006	0.02	0.04	0.006
Health outcomes	Life expectancy	-0.35	0.23	-0.005	0.30	0.26	0.004	0.19	0.25	0.003
	Life expectancy (male)	-0.40	0.28	-0.006	0.38	0.35	0.006	0.18	0.29	0.003
	Life expectancy (female)	-0.25	0.16	-0.003	0.16	0.16	0.002	0.19	0.20	0.002
	Under-5 MR (TransMONEE)	-0.15	0.93	-0.007	0.04	0.90	0.002	0.08	0.65	0.004
	Under-5 MR (WHO)	0.65	0.74	0.031	0.30	0.88	0.014	0.44	0.93	0.021
	Infant MR (WB)	1.00	0.72	0.089	-0.01	0.52	-0.001	0.00	0.68	0.000
	Infant MR (TransMONEE)	0.14	0.66	0.008	-0.19	0.57	-0.011	0.12	0.53	0.007
	Infant MR (WHO)	0.26	0.68	0.016	0.04	0.65	0.003	0.54	0.92	0.033
	Perinatal MR	0.16	0.49	0.013	0.05	0.46	0.004	0.09	0.72	0.007
	Neonatal MR	0.17	0.62	0.022	0.53	0.53	0.069	0.54	0.70	0.071
	Postneonatal MR	-0.46	0.28	-0.065	***-0.49***	***0.28***	***-0.069***	0.03	0.29	0.004
	Maternal MR	2.85	2.71	0.099	-0.61	3.71	-0.021	0.32	3.17	0.011
	Maternal MR (3-year)	1.61	1.37	0.055	-1.23	1.41	-0.042	0.56	1.81	0.019
	Caesarean sections	-1.72	1.19	-0.018	-1.91	2.18	-0.020	4.36	3.28	0.046
	SDR all causes	19.89	21.08	0.017	-20.60	18.87	-0.018	-23.74	21.79	-0.021
	SDR infeccious diseases	1.13	1.99	0.063	0.18	1.45	0.010	1.12	1.32	0.062
	SDR tuberculosis	1.81	1.57	0.172	-0.34	0.76	-0.033	0.40	0.73	0.038
	SDR diarrhoea (under 5)	1.86	4.48	0.058	4.29	6.40	0.135	-0.88	3.44	-0.028
	SDR ARI (under 5)	2.49	6.53	0.023	-5.46	7.39	-0.051	4.13	10.39	0.039
	SDR heart disease	6.21	6.71	0.020	-6.22	9.79	-0.020	-11.47	11.94	-0.038
	SDR liver diseases	-0.27	1.24	-0.009	-1.63	1.02	-0.051	1.77	1.45	0.056
	SDR diabetes	1.57	1.05	0.103	**-3.46**	**0.78**	**-0.228**	0.70	1.64	0.046
	SDR circulatory diseases	11.42	13.83	0.018	-6.76	12.61	-0.011	***-35.53***	***17.70***	***-0.057***
	SDR cerebrovascular diseases	4.62	4.96	0.026	-2.67	5.64	-0.015	***-12.58***	***6.34***	***-0.071***
	SDR neoplasms	2.24	2.54	0.013	0.90	2.45	0.005	-1.59	1.43	-0.009
	SDR female breast cancer	0.26	0.44	0.012	-0.28	0.37	-0.013	-0.46	0.40	-0.021
	SDR respiratory diseases	3.42	2.49	0.049	-4.22	2.70	-0.061	-0.78	2.41	-0.011
	SDR bronchitis	5.27	4.62	0.172	***-4.90***	***2.86***	***-0.160***	-2.07	2.73	-0.067
	SDR digestive diseases	-0.30	1.02	-0.006	-0.94	1.11	-0.019	1.88	1.41	0.038
	SDR alcohol causes	-0.17	5.36	-0.001	-5.28	8.24	-0.039	3.35	7.11	0.024
	SDR smoking causes	9.09	16.82	0.017	-7.00	14.22	-0.013	-23.13	13.60	-0.042
	Tuberculosis incidence rate	-5.04	4.01	-0.092	***4.40***	***2.47***	***0.081***	7.30	5.17	0.134
	Hepatitis incidence rate	15.90	25.59	0.121	20.91	23.52	0.159	30.44	19.17	0.231
	Hepatitis B incidence rate	0.54	1.27	0.033	0.85	0.84	0.051	0.62	0.98	0.038
	Measles incidence rate	-4.93	8.51	-0.412	-3.18	5.26	-0.266	-1.83	5.10	-0.152
	Mumps incidence rate	14.19	20.65	0.257	0.50	17.37	0.009	-41.51	49.69	-0.751
	Syphilis incidence rate	5.83	9.18	0.170	-2.41	6.26	-0.070	15.49	10.21	0.452
	Congenital syph incidence rate	-0.03	0.03	-0.173	***0.07***	***0.04***	***0.430***	-0.08	0.06	-0.486

					Hospital Payment Methods					
		SHI dummy			Fee-for-service			Patient-based		
	Dependent variable	Coef	SE	Impact (%)	Coef	SE	Impact (%)	Coef	SE	Impact (%)
	Pertussis incidence rate	1.61	1.39	0.395	-1.01	1.45	-0.248	**-1.76**	**0.82**	**-0.430**
	Diphteria incidence rate	-0.23	0.97	-0.152	-0.16	0.88	-0.105	0.54	0.99	0.351
	Tetanus incidence rate	0.01	0.02	0.107	***0.03***	***0.01***	***0.300***	0.00	0.02	0.050
	Cancer incidence rate	-2.42	3.29	-0.010	3.45	3.87	0.014	6.35	4.65	0.026
	Tuberculosis immunization rate	-1.26	1.82	-0.013	2.83	2.22	0.030	6.13	4.26	0.065
	DPT immunization rate	-1.82	2.27	-0.020	2.19	2.60	0.024	4.47	4.67	0.048
	Measles immunization rate	-0.25	0.84	-0.003	0.03	0.95	0.000	0.01	0.84	0.000
	Polio immunization rate	1.09	1.67	0.012	1.14	1.78	0.012	-0.19	1.35	-0.002
	Mumps immunization rate	4.88	6.21	0.059	7.31	6.13	0.088	2.44	7.67	0.030
	Rubella immunization rate	6.88	7.17	0.076	3.83	3.84	0.042	3.15	6.21	0.035
Hospitals	Length of stay (total)	-0.17	0.18	-0.014	-0.24	0.22	-0.019	-0.27	0.28	-0.021
	Length of stay (acute care)	0.06	0.16	0.005	**-0.33**	**0.14**	**-0.031**	-0.36	0.30	-0.033
	Bed occupancy rate	**2.51**	**1.12**	**0.035**	0.37	1.43	0.005	-2.23	1.36	-0.031
	Hospital beds	-0.11	0.15	-0.014	-0.11	0.18	-0.014	**-0.37**	**0.17**	**-0.047**
	In-patient admissions	0.19	0.16	0.012	**0.63**	**0.17**	**0.040**	0.03	0.25	0.002
	Acute care admissions	**0.38**	**0.18**	**0.025**	**0.48**	**0.21**	**0.031**	-0.02	0.31	-0.001
	Hospital discharges - infectious	***67.22***	***39.04***	***0.083***	40.35	53.67	0.050	26.03	25.37	0.032
	Hosp discharges - cancers	25.09	23.21	0.031	31.03	36.28	0.039	-46.50	33.94	-0.058
	Hosp discharges - heart	3.17	10.82	0.005	32.32	22.66	0.051	23.81	15.62	0.038
	Hosp discharges - circulatory	-42.09	62.89	-0.023	**141.61**	**66.66**	**0.076**	178.95	151.10	0.097
	Hosp discharges - cerebrov	7.94	5.28	0.024	19.05	11.59	0.058	-0.10	7.72	0.000
	Hosp discharges - respiratory	44.61	61.82	0.022	***170.54***	***85.36***	***0.086***	27.25	79.85	0.014
	Hosp discharges - digestive	-17.45	16.98	-0.011	***96.63***	***53.35***	***0.061***	11.42	26.48	0.007
	Hosp discharges - musculo	4.48	10.96	0.006	***48.61***	***25.08***	***0.064***	-12.44	22.35	-0.016
	SDR appendicitis	-0.05	0.06	-0.164	-0.04	0.05	-0.126	0.06	0.07	0.202
	SDR hernia & intestinal	-0.16	0.13	-0.071	***-0.19***	***0.11***	***-0.087***	0.10	0.15	0.046
	SDR adverse effects	-0.02	0.07	-0.103	-0.09	0.07	-0.436	0.10	0.07	0.459
	Surgical infection rate	**-1.34**	**0.46**	**-1.446**	-0.04	0.16	-0.043			

Notes: Results refer to the coefficient (Coef) and standard-error (SE, cluster-adjusted) of the dummies for SHI status, fee-for-service and patient-based payment methods. Significant at **5%** and ***10%***. The estimated impact (%) of each dummy on a given health outcome has been calculated over the average outcome in the corresponding estimating sub-sample.

Table 7: Basic results: labor market outcomes

	Basic model Eqn (2) estimated by OLS			*Random trend model* Eqn (4) estimated by fixed effects			
Dependent variable (log)	Coef	SE	p-value	Coef	SE	p-value	# shifts
Gross wage	**0.199**	**0.076**	**0.015**	**0.197**	**0.067**	**0.008**	6
Unemployment	0.050	0.050	0.333	0.022	0.056	0.692	7
Registered unemployment	0.182	0.198	0.368	0.166	0.182	0.373	11
Empl-to-pop – ILO	-0.007	0.013	0.596	-0.010	0.017	0.581	3
Empl-to-pop - TransMONEE	0.020	0.014	0.170	0.020	0.014	0.172	13
Informal economy	0.036	0.099	0.725	-0.002	0.106	0.985	10
Self-employment	0.040	0.089	0.658	0.018	0.066	0.787	4
Employment in agriculture	-0.021	0.016	0.220	-0.015	0.017	0.410	9

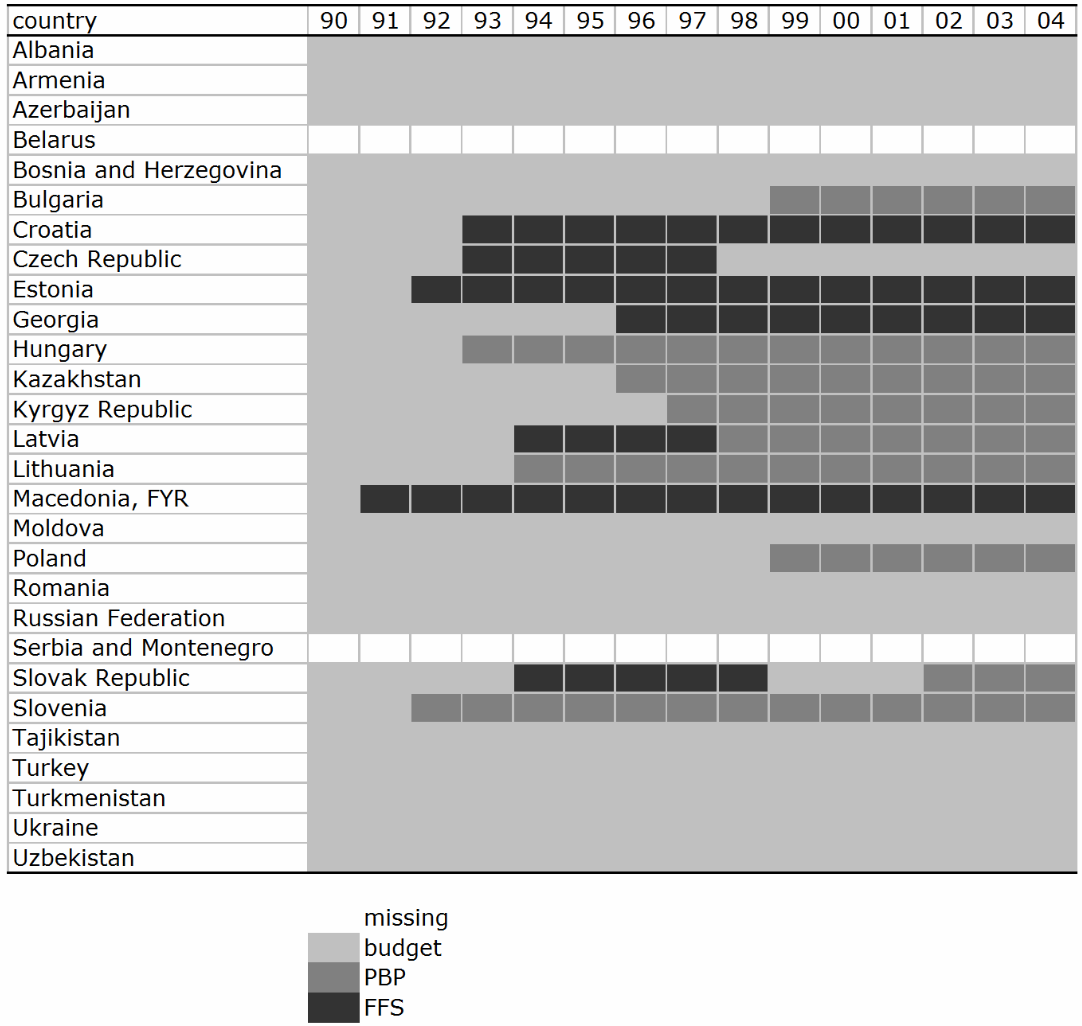
Notes: In all models, the natural logarithm of the dependent variable is used. Results refer to the coefficient (Coef) and standard-error (SE, cluster-adjusted) of the SHI dummy variable. Significant at **5%** and ***10%***. P-values from two-sided *t*-tests. In the last column, number of shifts refers to the number of transitions between tax-funded and SHI systems in the sub-sample used to estimate the corresponding coefficients.

Table 8: Instrumental variables: selected labor market outcomes

	Two-stage least squares estimates			GMM estimates			Partial statistic	Hansen statistic
Dependent variable (log)	Coef	SE	p-value	Coef	SE	p-value	*F*	*J*
Registered unemployment	**0.997**	**0.374**	**0.014**	**1.043**	**0.362**	**0.009**	**349.15**	0.26
Empl-to-pop - TransMONEE	***-0.102***	***0.056***	***0.082***	-0.084	0.050	0.107	**539.62**	0.52
Informal economy	0.008	0.354	0.983	0.023	0.352	0.950	**250.82**	0.21

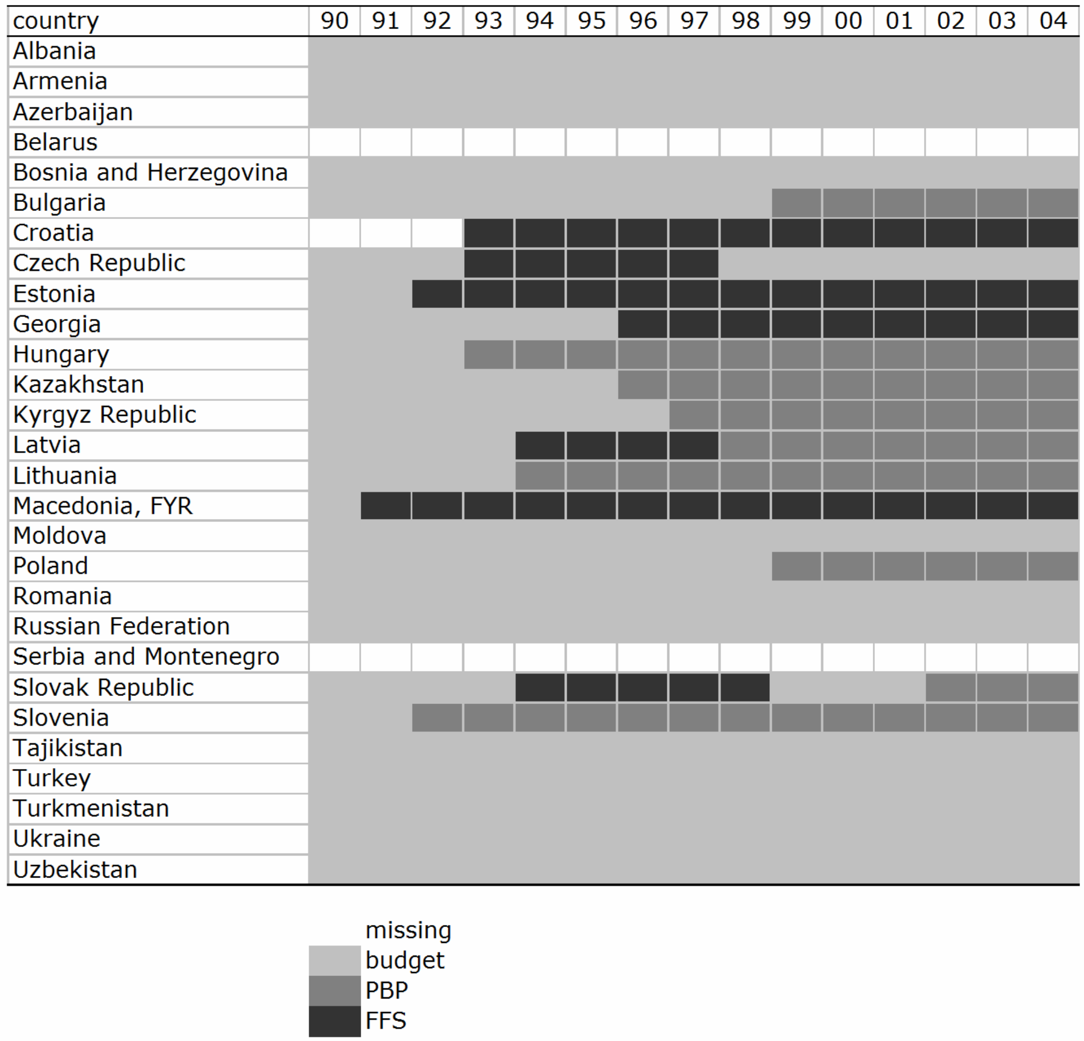
Notes: For all models, the natural logarithm of the dependent variable is used, and the excluded instruments are the first lag of the SHI dummy and an indicator for whether SHI existed in the country prior to communism. Results refer to the coefficient (Coef) and standard-error (SE, cluster-adjusted) of the SHI dummy variable. Significant at **5%** and ***10%***. P-values from two-sided *t*-tests. Partial *F* statistics (cluster-robust) refer to the joint insignificance test of the subset of excluded instruments in the first stage regressions. In the last column, cluster-robust Hansen's *J* statistics for the test of overidentifying restrictions are reported, where the joint null hypothesis is that the instruments are uncorrelated with the error term and that the excluded instruments are correctly excluded from the main equation.

Figure 1: SHI as a share of total health spending, 1990-2003



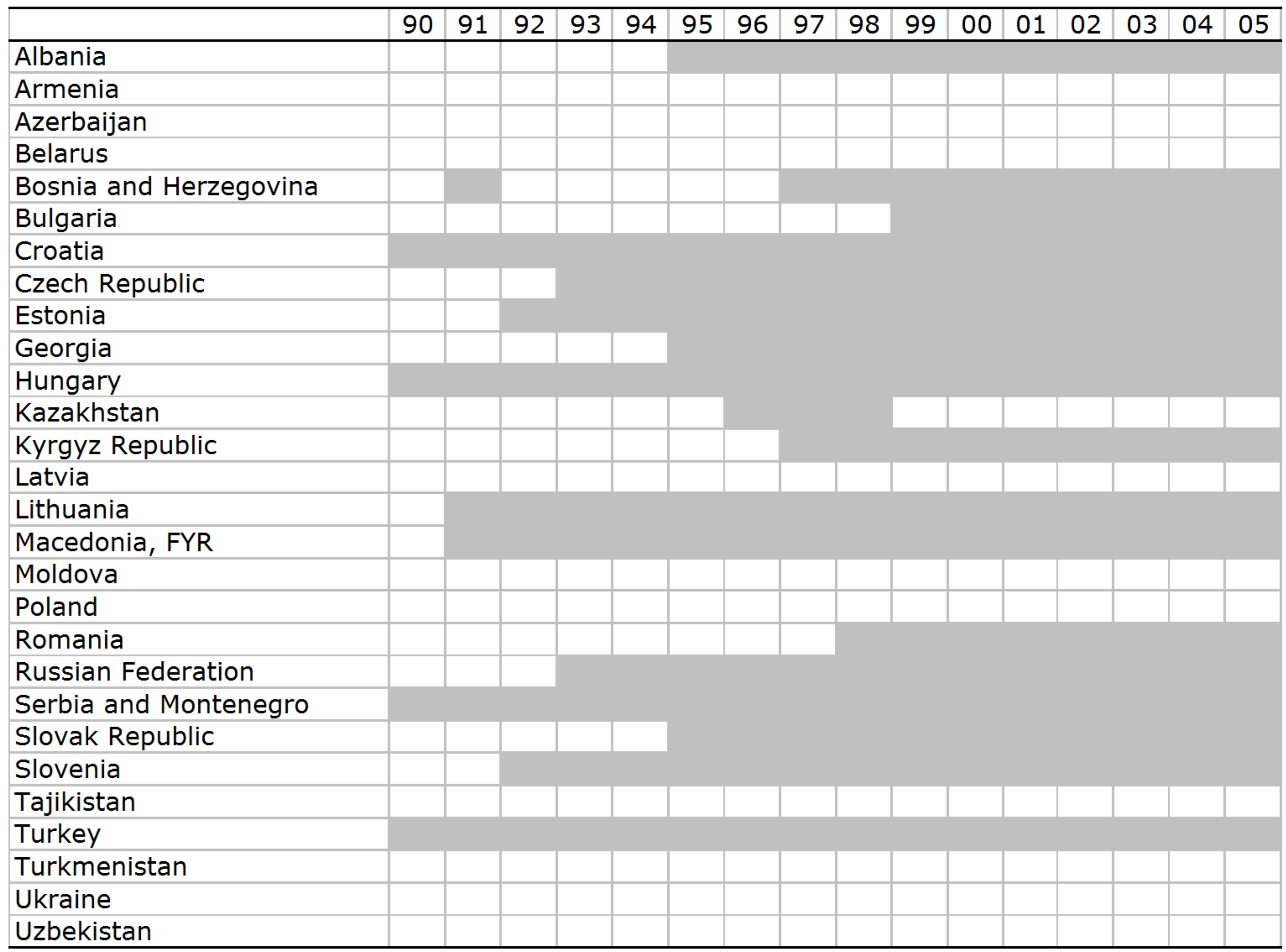
Source: HiTs and World Health Reports, various years

Figure 2: Hospital payment methods, 1990-2004



Source: HiTs

Figure 3: SHI classification, 1990-2003



Source: HiTs

Figure 4: The evolution of SHI adoption and average health expenditure per capita in ECA countries (1990-2004)

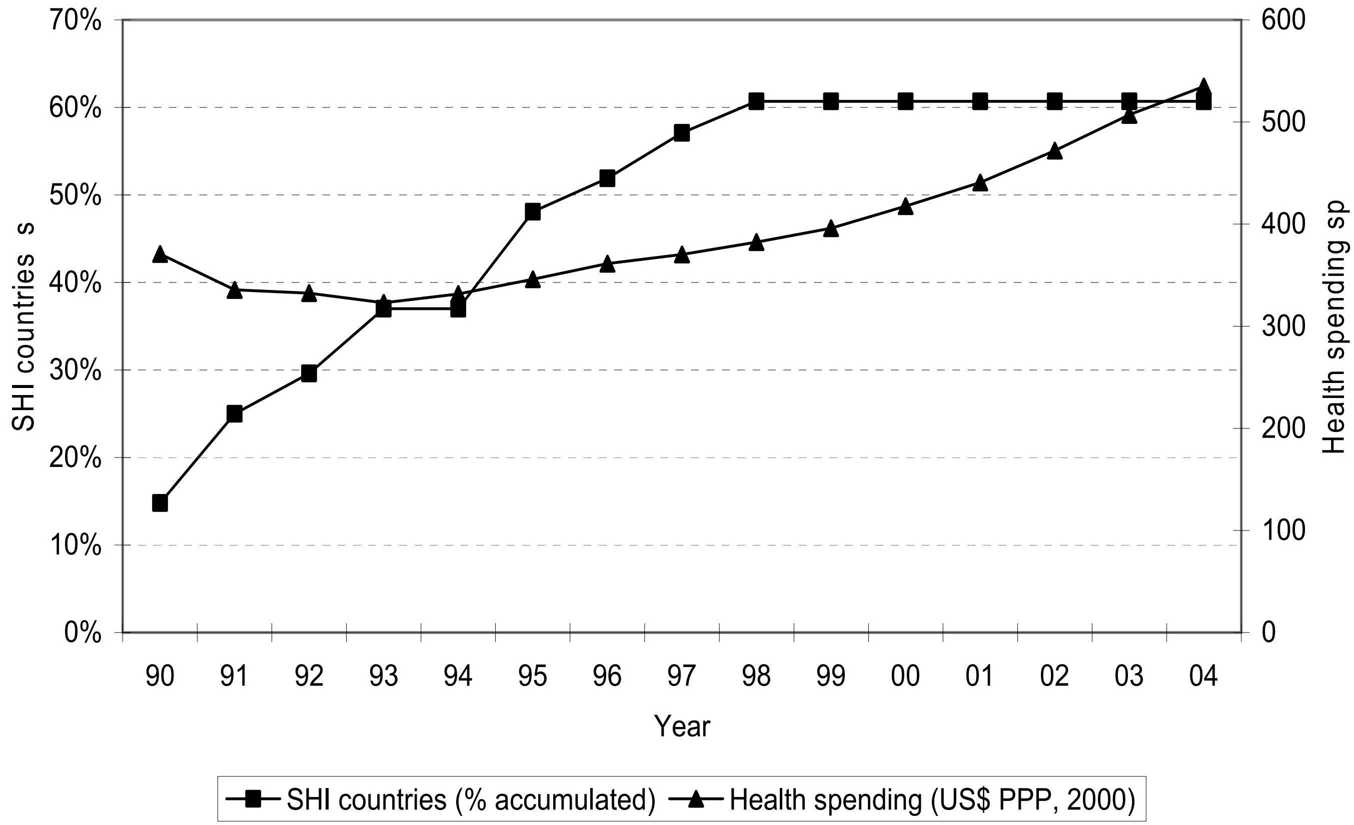


Figure 5: The evolution of SHI adoption and average infant mortality rate in ECA countries (1990-2004)

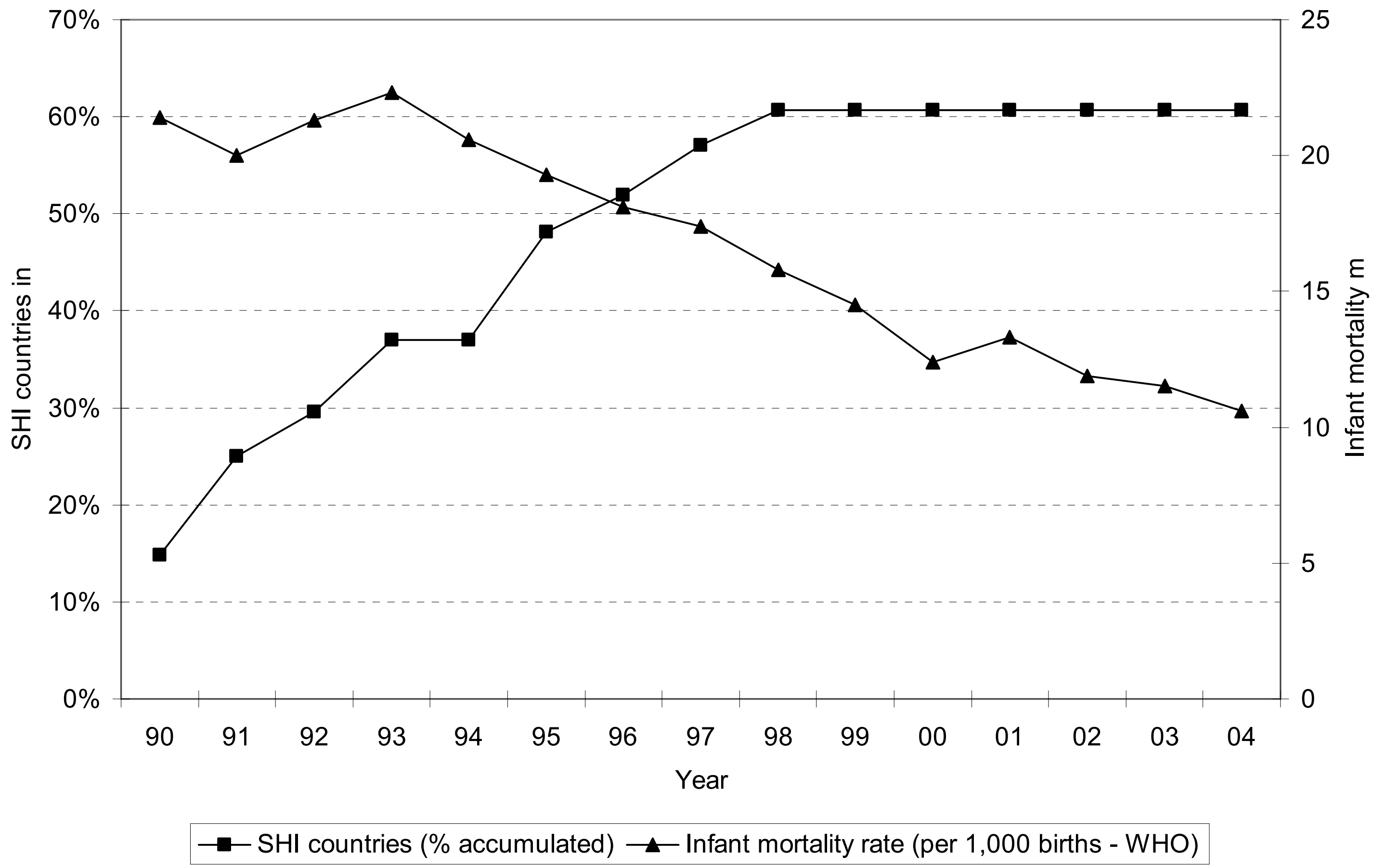


Figure 6: The evolution of SHI adoption and average unemployment rate in ECA countries (1990-2004)

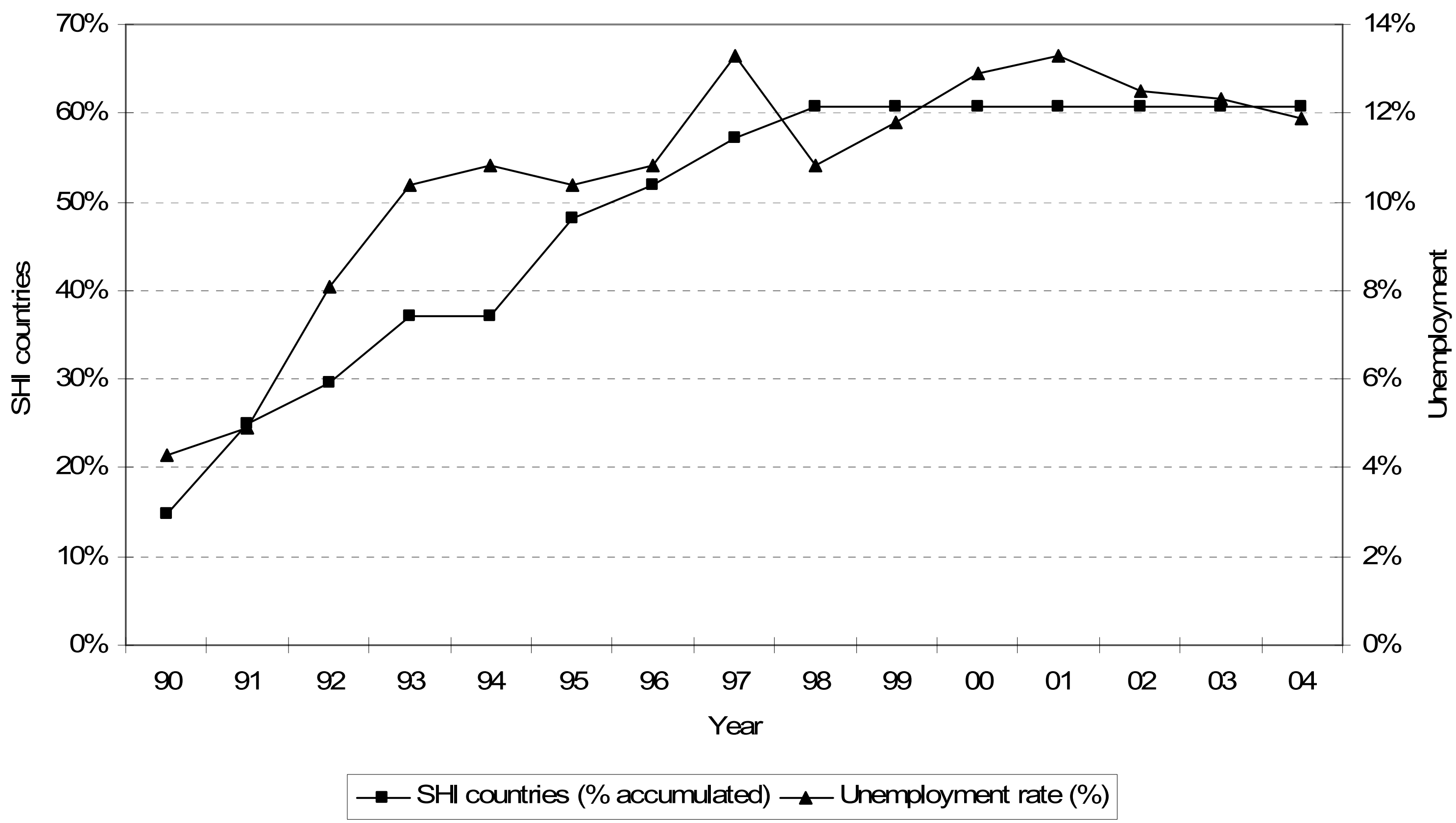
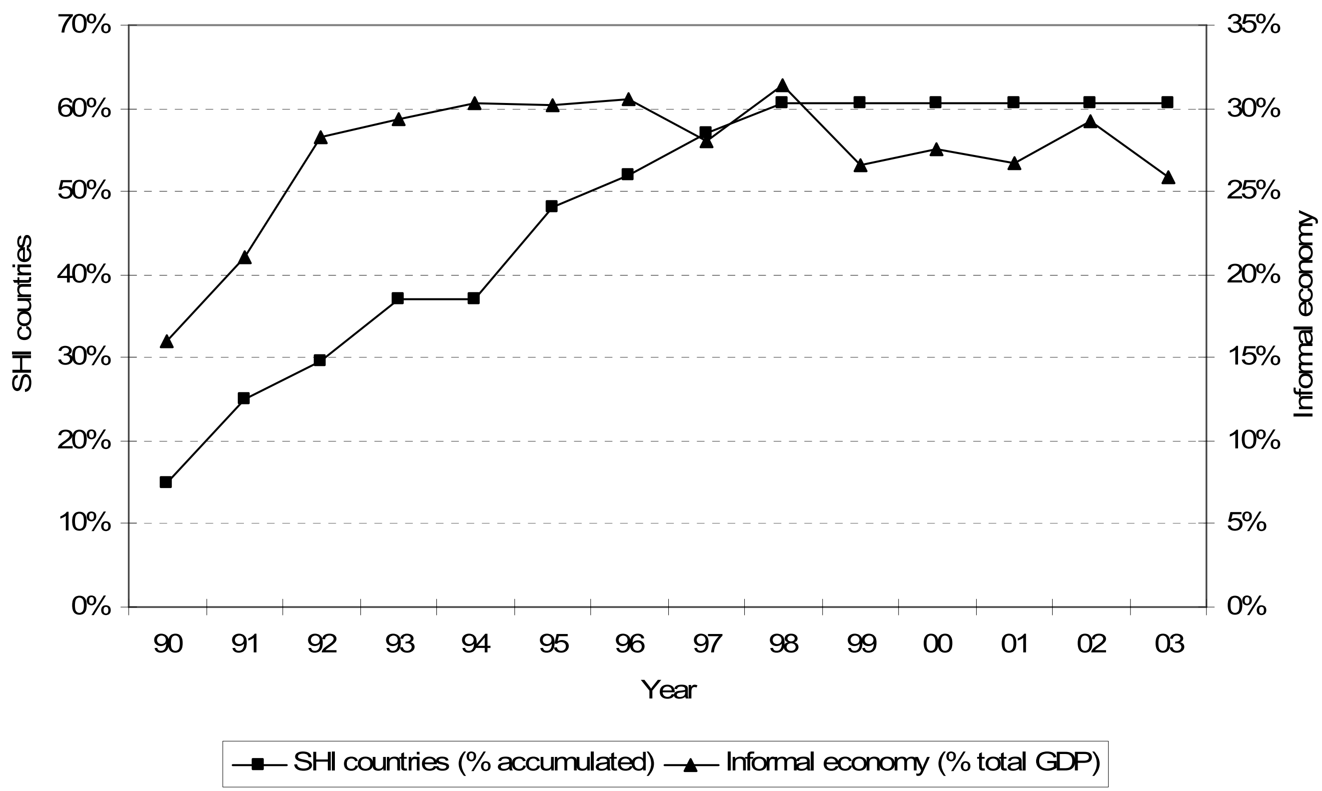


Figure 7: The evolution of SHI adoption and average informal economy size in ECA countries (1990-2003)



APPENDIX

Table 9: Health sector outcome variables: definitions and sources

Variable	Definition	Source
Total health expenditure per capita (constant 2000 international US$)	Sum of General Government and of Private Expenditure on Health. Estimates for this indicator were produced by WHO. Data are in constant 2000 international dollars (deflated using the US GDP deflator).	Own calculations, based on the following sources: 1990-1997: WDI 2002 database (Serbia and Montenegro = Yugoslavia, Fed.). From 1998 onwards: WHO estimates, HFA-DB.
Government health expenditure per capita (constant 2000 international US$)	General Government Expenditure on Health. Estimates for this indicator were produced by WHO. Data are in constant 2000 international dollars (deflated using the US GDP deflator).	See above.
Private health expenditure per capita (constant 2000 international US$)	Private Expenditure on Health. Estimates for this indicator were produced by WHO. Data are in constant 2000 international dollars (deflated using the US GDP deflator).	See above.
Salaries as percentage of total government health expenditure	Includes salaries, bonuses to fixed rate wages and salaries, and overtime payments to employees in the publicly financed health sector.	WHO, HFA-DB.
Physicians (per 1,000 people)	Physicians are defined as graduates of any facility or school of medicine who are working in the country in any medical field (practice, teaching, research).	WDI Database - DDP, based on data from World Health Organization, OECD, TransMONEE, supplemented by country data.
Life expectancy at birth, in years	Calculated by WHO/EURO for all countries which report detailed mortality data to WHO, using Wiesler's method.	WHO, HFA-DB.
Life expectancy at birth, in years, male	Calculated by WHO/EURO for all countries which report detailed mortality data to WHO, using Wiesler's method.	WHO, HFA-DB.
Life expectancy at birth, in years, female	Calculated by WHO/EURO for all countries which report detailed mortality data to WHO, using Wiesler's method.	WHO, HFA-DB.
Mortality rate, under-5 (per 1,000) – TransMONEE	Probability of dying before age 5 years per 1000 live births, calculated as the number of deaths per 1000 live births until 5 years of age.	TransMONEE 2006 Database, UNICEF IRC, Florence.
Mortality rate, under-5 (per 1,000) – WHO	See above.	WHO, HFA-DB.
Mortality rate, infant (per 1,000 live births) - World Bank	Number of infants dying before reaching one year of age, per 1,000 live births in a given year. Harmonized estimates of the World Health Organization, UNICEF, and the World Bank, based mainly on household surveys, censuses, and vital registration, supplemented by World Bank estimates based on household surveys and vital registration.	WDI-DDP database.

Variable	Definition	Source
Mortality rate, infant (per 1,000 live births) – TransMONEE	Number of infants dying before reaching one year of age, per 1,000 live births in a given year.	TransMONEE 2006 Database, UNICEF IRC, Florence.
Mortality rate, infant (per 1,000 live births) - WHO	See above.	WHO, HFA-DB.
Perinatal mortality rate (per 1,000 births)	Weight specific (1000 g +) fetal deaths and early neonatal deaths per 1000 births (live births+stillbirths)	WHO, HFA-DB.
Neonatal mortality rate (per 1,000 live births)	Number of deaths in infants under 28 days of age in a year, per 1000 live births in that year (ICD-10).	WHO, HFA-DB.
Postneonatal mortality rate (per 1,000 live births)	Number of deaths in infants between 4 weeks and a year of age in a year, per 1000 live births in that year (ICD-10).	WHO, HFA-DB.
Maternal mortality rate (per 100,000 live births)	Maternal deaths per 100,000 live births. A maternal death is death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.	WHO, HFA-DB.
Maternal mortality rate (per 100,000 live births) - moving average (3 years)	Moving average (3 years) of maternal deaths per 100,000 live births.	WHO, HFA-DB.
Caesarean sections (per 1,000 live births)	Number of caesarean sections per 1000 live births.	WHO, HFA-DB.
Death rate, all causes (per 100,000)	Standardized death rate, all causes, all ages, per 100,000.	WHO, HFA-DB.
Death rate, infectious diseases (per 100,000)	Standardized death rate, infectious and parasitic diseases, all ages, per 100,000.	WHO, HFA-DB.
Death rate, tuberculosis (per 100,000)	Standardized death rate, tuberculosis, all ages, per 100,000.	WHO, HFA-DB.
Death rate, diarrhoeal diseases, under five years (per 100,000)	Standardized death rate, diarrhoeal diseases, under 5 years per 100,000.	WHO, HFA-DB.
Death rate, ARI, under five years (per 100,000)	Standardized death rate, acute respiratory infections, under 5 years per 100,000.	WHO, HFA-DB.
Death rate, ischaemic heart disease (per 100,000)	Standardized death rate, ischaemic heart disease, all ages per 100,000.	WHO, HFA-DB.
Death rate, liver diseases (per 100,000)	Standardized death rate, chronic liver disease and cirrhosis, all ages per 100,000.	WHO, HFA-DB.
Death rate, diabetes (per 100,000)	Standardized death rate, diabetes, all ages, per 100,000.	WHO, HFA-DB.
Death rate, circulatory diseases (per 100,000)	Standardized death rate, diseases of circulatory system, all ages, per 100,000.	WHO, HFA-DB.
Death rate, cerebrovascular diseases (per 100,000)	Standardized death rate, cerebrovascular diseases, all ages, per 100,000.	WHO, HFA-DB.
Death rate, neoplasms (per 100,000)	Standardized death rate, malignant neoplasms, all ages, per 100,000.	WHO, HFA-DB.

Variable	Definition	Source
Death rate, breast cancer (per 100,000)	Standardized death rate, malignant neoplasm female breast, all ages, per 100,000.	WHO, HFA-DB.
Death rate, respiratory diseases (per 100,000)	Standardized death rate, diseases of the respiratory system, all ages, per 100,000.	WHO, HFA-DB.
Death rate, bronchitis/emphysema/asthma (per 100,000)	Standardized death rate, bronchitis/emphysema/asthma, all ages, per 100,000.	WHO, HFA-DB.
Death rate, digestive diseases (per 100,000)	Standardized death rate, diseases of the digestive system, all ages, per 100,000.	WHO, HFA-DB.
Death rate, alcohol causes (per 100,000)	Standardized death rate, selected alcohol related causes, per 100,000. The mortality from combined, selected causes of death which are known from literature to be related to alcohol consumption. Includes: cancer of oesophagus and larynx; alcohol dependence syndrom; chronic liver disease and cirrhosis; all external causes.	WHO, HFA-DB.
Death rate, smoking causes (per 100,000)	Standardized death rate, selected smoking related causes, per 100,000. The mortality from combined, selected causes of death which are known from literature to be related to smoking. Includes: cancers of mouth and pharynx, larynx, traxea, bronchus, lung and oesophagus; ischaemic heart disease; cerebrovascular diseases; chronic obstructive pulmonary disease.	WHO, HFA-DB.
Tuberculosis incidence rate (per 100,000)	Tuberculosis incidence per 100,000. Number of newly diagnosed tuberculosis cases, all forms (ICD-9:010-018; ICD-10: A15-A19) during the given calendar year.	WHO, HFA-DB.
Hepatitis incidence rate (per 100,000)	Viral hepatitis incidence per 100,000.	WHO, HFA-DB.
Hepatitis B incidence rate (per 100,000)	Viral hepatitis B incidence per 100,000.	WHO, HFA-DB.
Measles incidence rate (per 100,000)	Measles incidence per 100,000.	WHO, HFA-DB.
Mumps incidence rate (per 100,000)	Mumps incidence per 100,000.	WHO, HFA-DB.
Syphilis incidence rate (per 100,000)	Syphilis incidence per 100,000.	WHO, HFA-DB.
Congenital syphilis incidence rate (per 100,000)	Congenital syphilis incidence per 100,000.	WHO, HFA-DB.
Pertussis incidence rate (per 100,000)	Pertussis incidence per 100,000.	WHO, HFA-DB.
Diphteria incidence rate (per 100,000)	Diphteria incidence per 100,000.	WHO, HFA-DB.
Tetanus incidence rate (per 100,000)	Tetanus incidence per 100,000.	WHO, HFA-DB.
Cancer incidence rate (per 100,000)	Cancer incidence per 100,000. Number of patients with newly diagnosed cancer during given calendar year.	WHO, HFA-DB.

Variable	Definition	Source
Immunization rate, tuberculosis, infants (%)	Percentage of infants reaching their first birthday in the given calendar year who have been fully vaccinated against tuberculosis (BCG, 1 dose).	WHO, HFA-DB.
Immunization rate, DPT, infants (%)	Percentage of children under 2 immunized against diphtheria, pertussis and tetanus.	TransMONEE 2006 Database, UNICEF IRC, Florence.
Immunization rate, measles, infants (%)	Percentage of children reaching their second birthday who have been fully vaccinated against measles (1 dose).	WHO, HFA-DB.
Immunization rate, poliomyelitis, infants (%)	Percentage of infants reaching their first birthday in the given calendar year who have been fully vaccinated against poliomyelitis (3 doses).	WHO, HFA-DB.
Immunization rate, mumps, infants (%)	Percentage of infants reaching their second birthday in the given calendar year who have been fully vaccinated against mumps.	WHO, HFA-DB.
Immunization rate, rubella, infants (%)	Percentage of infants reaching their second birthday in the given calendar year who have been fully vaccinated against rubella.	WHO, HFA-DB.
Average length of stay, all hospitals	Total number of occupied hospital bed-days of all hospitals divided by the total number of admissions or discharges in those hospitals. Length of stay (LOS) of one patient = date of discharge - date of admission. If these are the same dates, then LOS is set to one day. Bed-days of newborns are excluded in the calculation.	WHO, HFA-DB.
Average length of stay, acute care hospitals only	Total number of occupied hospital bed-days of short-stay hospitals divided by the total number of admissions or discharges in those hospitals.	WHO, HFA-DB.
Bed occupancy rate (%), acute care hospitals only	Average number of days when hospital bed was occupied as percentage of available 365 days. Calculation: utilized bed-days x 100/available bed-days during the calendar year.	WHO, HFA-DB.
Hospital beds (per 1,000 people)	Hospital beds include in-patient beds available in public, private, general, and specialized hospitals and rehabilitation centers. In most cases beds for both acute and chronic care are included.	WDI Database - DDP, based on data from World Health Organization, OECD, TransMONEE, supplemented by country data.
In-patient care admissions (per 100)	Admission is the hospitalization of a patient in an in-patient facility normally involving a stay of at least 24 hours. In the case of death or discharge to another health establishment, the actual stay may be shorter than 24 hours. These cases are registered as a one-day hospitalization. The number of admissions excludes: a transfer from one department to another one at the same hospital; day-cases of day patients; weekend leave when the patient has been released temporarily and the hospital bed is still reserved; cases where treatment is provided by hospital personnel at the patient's home. Newborns are not included.	WHO, HFA-DB.

Variable	Definition	Source
Acute care hospital admissions (per 100)	Same as above, short stay hospitals only.	WHO, HFA-DB.
Hospital discharges, infectious and parasitic diseases (per 100,000)	Total number of patients discharged from all hospitals during the given calendar year with the principal diagnosis falling into the group of infectious and parasitic diseases (Chapter I of ICD-9/10). Discharge is the conclusion of a period of in-patient care, whether the patient returned to his home, was transferred to another in-patient facility or died.	WHO, HFA-DB.
Hospital discharges, all cancers (per 100,000)	Total number of patients discharged from all hospitals during the given calendar year with the principal diagnosis falling into the group of cancers (Chapter II of ICD-9/10).	WHO, HFA-DB.
Hospital discharges, ischaemic heart disease (per 100,000)	Total number of patients discharged from all hospitals during the given calendar year with the principal diagnosis falling into the group of ischaemic heart diseases (ICD-10: I20-I25).	WHO, HFA-DB.
Hospital discharges, circulatory system diseases (per 100,000)	Total number of patients discharged from all hospitals during the given calendar year with the principal diagnosis falling into the group of circulatory system diseases (Chapter IX of ICD-10).	WHO, HFA-DB.
Hospital discharges, cerebrovascular diseases (per 100,000)	Total number of patients discharged from all hospitals during the given calendar year with the principal diagnosis falling into the group of cerebrovascular diseases (ICD-10: I60-I69).	WHO, HFA-DB.
Hospital discharges, respiratory diseases (per 100,000)	Total number of patients discharged from all hospitals during the given calendar year with the principal diagnosis falling into the group of respiratory diseases (Chapter X of ICD-10).	WHO, HFA-DB.
Hospital discharges, digestive system diseases (per 100,000)	Total number of patients discharged from all hospitals during the given calendar year with the principal diagnosis falling into the group of digestive system diseases (Chapter XI of ICD-10).	WHO, HFA-DB.
Hospital discharges, musculoskeletal system and connective tissue diseases (per 100,000)	Total number of patients discharged from all hospitals during the given calendar year with the principal diagnosis falling into the group of musculoskeletal system and connective tissue diseases (Chapter XIII of ICD-10).	WHO, HFA-DB.
Death rate, appendicitis (per 100,000)	Standardized death rate, appendicitis, all ages, per 100,000.	WHO, HFA-DB.
Death rate, hernia and intestinal obstruction (per 100,000)	Standardized death rate, hernia and intestinal obstruction, all ages, per 100,000.	WHO, HFA-DB.
Death rate, adverse effects of therapeutic agents (per 100,000)	Standardized death rate, adverse effects of therapeutic agents, all ages, per 100,000.	WHO, HFA-DB.
Surgical infection rate, all operations (%)	Average rate of in-patient surgical operations in all hospitals with postoperative surgical wound infection during the given calendar year (ICD-10:	WHO, HFA-DB.

Variable	Definition	Source
	T81.4)	

Table 10: Labor sector outcome variables: definitions and sources

Variable	Definition	Source
Average wage rate, gross (constant 2000 international dollars)	Total annual gross wages and salaries in constant PPP averages for the employed population aged 15-59.	Own calculations based on data from WB-WDI and TransMONEE databases.
Unemployment, total (% of total labor force)	Share of the labor force that is without work but available for and seeking employment. National rates based on labor force sample surveys.	ILO - LABORSTA, KILM database.
Registered unemployment, total (% of total labor force)	Number of persons looking for work who are entered on the registers at the end of each month.	ILO - LABORSTA, KILM database.
Employment-to-population ratio (%) - ILO	Proportion of a country's working-age population that is employed. Original sources are labor force surveys and official estimates available mainly at LABORSTA and OECD.	ILO - LABORSTA, KILM database.
Employment-to-population ratio (%) - TransMONEE	Number of employed as per cent of population aged 15-59. Original sources are labor force surveys, ILO and CIS Stat.	TransMONEE 2006 Database, UNICEF IRC, Florence.
Informal economy as a share of the total GDP (%) - Own calculations	Informal GDP as a percentage of the total (formal + informal) GDP. Annual estimates are based on the growth rate of the national electricity output as a proxy for total GDP growth, which are compared to the growth rate of the official (measured) GDP to give an estimate of the evolution of the size of the informal economy.	Own calculations based on initial values for the size of the informal economy provided by Johnson et al. (1997) and WDI-WB database.
Self-employment (% of total employment)	Self-employed individuals as a share of total employment. The self-employed category is defined as those individuals who are either own-account workers (a person who operates his or her own economic enterprise, or engages independently in a profession or trade, and hires no employees) or members of producers' cooperatives (a person who is an active member of a producers’ cooperative, regardless of the industry in which it is established).	ILO - LABORSTA, KILM database.
Employment in agriculture (% of total employment)	Number of employees working in the agricultural sector as a share of total employment. Employees are people who work for a public or private employer and receive remuneration in wages, salary, commission, tips, piece rates, or pay in kind.	ILO - LABORSTA, KILM database.

Table 11: Covariates included in the *X*-vector: definitions and sources

Variable	Definition	Source
GDP per capita (constant 2000 international dollars)	GDP per capita based on purchasing power parity (PPP). Data are in constant 2000 international dollars (deflated using the US GDP deflator).	WB-WDI Database.
Population ages 65 and above (% of total)*	Percentage of the total population that is 65 or older.	WB-WDI Database.
Urban population (% of total)*	Urban population is the midyear population of areas defined as urban in each country and reported to the United Nations.	WB-WDI Database.

* Excluded from labor models.

Table 12: Classification of hospital payment methods in the dataset

Country	SHI adoption	Hospital Payment Methods: Predominant method	Hospital Payment Methods: Years	Values assumed by the corresponding dummies in the dataset
Albania	1995	B		B=1 throughout
Armenia	Never	B		B=1 throughout
Azerbaijan	Never	B		B=1 throughout
Belarus	Never	?		all missing
Bosnia and Herzegovina	Prior to 1990	B		B=1 throughout
Bulgaria	1999	B	Until 1998	B=1 (until 1998)
		PBP	1999 onwards	PBP=1 (1999 onwards)
Croatia	Prior to 1990	B	Until 1992	B=1 (until 1992)
		FFS	1993 onwards	FFS=1 (1993 onwards)
Czech Republic	1993	B	Until 1992	B=1 (until 1992)
		FFS	1993-1997	FFS=1 (1993-1997)
		B	1998 onwards	B=1 (1998 onwards)
Estonia	1992	B	Until 1991	B=1 (until 1991)
		FFS	Until 2003	FFS=1 (1992-2003)
		PBP	2004 onwards	PBP=1 (2004 onwards)
Georgia	1995	B	Until 1995	B=1 (until 1995)
		PBP	1996 onwards	PBP=1 (1996 onwards)
Hungary	1990	B	Until 1992	B=1 (until 1992)
		PBP	1993 onwards	PBP=1 (1993 onwards)
Kazakhstan	1996 (scrapped 1998)	B	Until 1995	B=1 (until 1995)
		PBP	1996 onwards	PBP=1 (1996 onwards)
Kyrgyz Republic	1997	B	Until 1996	B=1 (until 1996)
		PBP	1997 onwards	PBP=1 (1997 onwards)
Latvia	Never	B	Until 1993	B=1 (until 1993)
		FFS	1994-1997	FFS=1 (1994-1997)
		PBP	1998 onwards	PBP=1 (1998 onwards)
Lithuania	1991	B	Until 1993	B=1 (until 1993)
		PBP	1994 onwards	PBP=1 (1994 onwards)
Macedonia, FYR	1991	B	Until 1990	B=1 (until 1990)
		FFS	1991 onwards	FFS (1991 onwards)
Moldova	Never	B		B=1 throughout
Poland	Never	B	Until 1998	B=1 (until 1998)
		PBP	1999 onwards	PBP=1 (1999 onwards)
Romania	1998	B		B=1 throughout
Russian Federation	1993	B		B=1 throughout
Serbia and Montenegro	Prior to 1990	?		all missing
Slovak Republic	1995	B	Until 1993	B=1 (until 1993)
		FFS	1994-1998	FFS=1 (1994-1998)
		B	1999-2001	B=1 (1999-2001)
		PBP	2002 onwards	PBP=1 (2002 onwards)
Slovenia	1992	B	Until 1991	B=1 (until 1991)
		PBP	1992 onwards	PBP=1 (1992 onwards)
Tajikistan	Never	B		B=1 throughout
Turkey	Prior to 1990	B		B=1 throughout
Turkmenistan	Never	B		B=1 throughout
Ukraine	Never	B		B=1 throughout

Country	SHI adoption	Hospital Payment Methods		Values assumed by the corresponding dummies in the dataset
		Predominant method	Years	
Uzbekistan	Never	B		B=1 throughout

Notes: B = fixed budget/block grants; FFS = fee-for-service/payment by bed days; PBP = patient-based payment method.

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